PART I: Is there an association between caregiver antipathy and psychosis? A systematic review. PART II: Empirical research project:Investigating specific relationships between childhood trauma and psychosis symptoms and the mediating roles of emotions and schema.

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VOLUME I

SYSTEMATIC LITERATURE REVIEW

EMPIRICAL RESEARCH PROJECT

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PART I: SYSTEMATIC LITERATURE REVIEW

Is there an association between caregiver antipathy and psychosis? A systematic review

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ABSTRACT

Background: Existing reviews of trauma and psychosis have identified a relationship between childhood emotional abuse (CEA) and psychosis, but have not distinguished between different types of CEA. Thus, further investigation is needed. This systematic review aimed to explore the relationship between caregiver antipathy in childhood (i.e. criticism, hostility, coldness or rejection shown by parent figures towards the child) and psychosis diagnosis/symptoms.

Method: Five databases were searched and studies were evaluated against inclusion/exclusion criteria. The relevant data was extracted and a narrative synthesis of key findings was completed. Estimates of effect size for antipathy-psychosis associations were calculated using standardised conventions. Assessment of study quality was undertaken using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.

Results: Fourteen papers met all inclusion criteria. Twelve studies found significant associations between caregiver antipathy and psychosis and two did not. There was evidence that adults with schizophrenia-spectrum diagnosis reported more severe caregiver antipathy in childhood than non-clinical controls. In addition, caregiver antipathy was associated with more severe psychosis symptoms. Most studies received weak or moderate overall quality ratings.

Conclusions: This is the first review to focus on investigating the relationship between caregiver antipathy and psychosis. The variability in study methods and quality makes it difficult to draw firm conclusions about the nature and strength of these associations. Further studies using more robust methodological and statistical procedures are required to consolidate the emerging evidence.

1. INTRODUCTION

1.1. Childhood victimisation and psychosis

While there are multiple heterogeneous pathways to psychosis, a large body of empirical research has focused on the proposed causal role of childhood trauma. This term is generally used to describe a range of victimisation events or interpersonal adversities prior to the age of 16 years (Morgan & Geyer-Anderson, 2016). In psychosis research, the most commonly studied trauma types tend to be childhood sexual abuse (CSA), childhood physical abuse (CPA), childhood emotional abuse (CEA) and childhood neglect (CN) (Turner et al. 2020).

Several meta-analyses have established robust associations between childhood victimisation with psychosis symptoms in the general population (Trotta, Murray & Fisher, 2015), the onset of high-risk states for psychosis (Fusar-Poli et al. 2017), and schizophrenia -spectrum diagnoses (Varese et al., 2012; Matheson et al., 2013). Recently, there has been an empirical shift towards studying specificity in the relationship between childhood victimisation and psychosis symptoms. A meta-analysis by Bailey et al. (2018) found specific associations between CSA and positive symptoms and CN and negative symptoms. There was also evidence for specific associations between CSA and hallucinations and delusions; however delusions were more robustly associated with total childhood trauma over specific victimisation types. However, a key limitation of this review was that it only reported associations of psychosis with CSA, CN and total trauma. This is problematic as previous meta-analysis of trauma and psychosis found strong associations with other childhood trauma sub-types, including CEA (Fusar-Poli et al. 2017). Therefore, further investigation is needed to clarify the

nature and strength of associations between certain types of childhood victimisation with psychosis symptoms/diagnosis.

1.2. CEA and mental health

CEA is defined as persistent psychological maltreatment that may take the form of degrading insults, humiliation or threats of abandonment (Chamberland et al. 2012). These events are proposed to elicit emotional harm through psychological processes such as fear, guilt or shame (Taillieu et al. 2016). As CEA is likely to be chronic and pervasive, it may be a particularly potent long-term risk factor for many adverse mental health outcomes (Dias et al. 2015; Vachon et al., 2015).

CEA has an estimated worldwide prevalence rate of around 12-16% in the general population (Moody et al. 2018). Empirical evidence shows it may be the most frequently reported form of childhood victimisation in clinical populations and often co-occurs with other types of childhood victimisation (Debowska et al. 2017). Some studies have even shown that when controlling for other childhood victimisation types, CEA may be an independent predictor of symptom severity in diagnoses such as major depression (Nelson et al. 2017), anxiety disorders (Fonzo et al., 2016) and personality disorders (Rosenstein et al. 2018).

Despite empirical evidence to show the potentially toxic effects of CEA, a disproportionate focus has been given to studying the prevalence and impact of CSA and CPA in mental health research (Cecil et al. 2017). This may be because the definition of CEA tends to vary more widely between studies and there is a lack of consensus around severity thresholds for this abuse type (Stoltenborgh et al. 2012). Thus, greater empirical focus should be given to improving conceptual understanding of CEA and its role across different mental health outcomes.

1.3. CEA and psychosis

CEA may be the most common trauma type among clinical samples of adults with psychosis (Duhig et al. 2015), and has an estimated prevalence rate of around 34% (Bonoldi et al. 2013). Several meta-analyses have investigated relationships between specific trauma types and psychosis risk, and while some have found that CEA is associated with higher odds of psychosis diagnosis compared to other trauma events, including CSA and CPA (e.g. Varese et al. 2012; Fusar-Poli et al. 2017), others have not replicated this finding (Trotta et al. 2015).

To date, empirical evidence outlining the nature and strength of the relationship between CEA and psychosis appears to be lacking, and only one review has been published on this topic. A narrative review by Ackner et al. (2013) identified fifteen studies that reported a measure of CEA and psychosis in both clinical and non-clinical samples. Evidence was found for an association between CEA and psychosis diagnosis, and CEA and global hallucination/delusion severity in non-clinical samples. However, this review was not systematic and the quality of included studies was not assessed; thus, the current evidence base for the impact of CEA in psychosis remains to be investigated.

1.4. Limitations of CEA and psychosis research

As it stands, there are two key conceptual issues relating to definitions of CEA in the trauma-psychosis literature. First, many existing reviews reporting separate associations of CEA and psychosis combine both active and passive forms of victimisation (i.e. emotional abuse *and* emotional neglect) to obtain a composite CEA measure. This is problematic, as emotional abuse encompasses a range of acts of commission and omission and some evidence suggests that the two types may have differential effects in other mental health diagnoses, including anxiety

disorders and borderline personality disorder (Kuo et al. 2011; Lobbestael et al. 2010). It is therefore reasonable to suggest that further investigation is needed to assess the impact of specific CEA types in psychosis.

Secondly, CEA can occur at home or outside the home, and whilst empirical evidence is accumulating for a relationship between childhood bullying and psychosis (e.g. Cunningham, Hoy & Shannon, 2016), CEA at home may have a more detrimental impact than peer victimisation as it represents a greater violation of relational safety (Taillieu et al., 2016). Most studies included in existing trauma and psychosis reviews employed the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 2003) a self-report measure assessing experiences of abuse and neglect prior to age 18 years. Whilst the CTQ covers five widely studied trauma domains, and does separate emotional from physical neglect, the CEA subscale items do not refer specifically to caregiver attitudes/behaviours and do not ask about CEA outside of the family home.

Together, these limitations mean that existing reviews of trauma and psychosis are limited in being able to make nuanced inferences about the impact of CEA within the core caregiving relationship. Developing a better understanding of the nature and impact of caregiver CEA in psychosis will be important for advancing theoretical and clinical practice, as if caregiver CEA uniquely impacts certain psychological mechanisms, which have previously been hypothesised to play a role in psychosis risk and symptom maintenance, then these mechanisms may be targeted in psychological interventions.

1.5. CEA and attachment models of psychosis

Cognitive models of psychosis propose that for some individuals, exposure to interpersonal trauma may lead to the development of negative beliefs about the

self and others, which interact with anomalous experiences and psychological processes (cognition and emotions) to give rise to positive symptoms (Garety et al. 2001). Recently, it has been proposed that ideas from attachment theory may be a complementary framework for understanding the impact of caregiver abuse in psychosis (Berry, Bucci & Danquah, 2019). Specifically, attachment models of psychosis (e.g. Barker, Gumley, Schwannauer & Lawrie, 2015) hypothesise that caregiver abuse impacts the development of the attachment system and the conception of 'internal working models' or schema. In turn, this may lead to negative self/other beliefs and maladaptive methods of regulating emotional distress, both of which have been associated with psychosis risk and symptom maintenance (Berry, Varese & Bucci, 2017; Hardy, 2017).

Additionally, it has been hypothesised that certain types of caregiver abuse may predict certain symptoms of psychosis through specific psychological mechanisms (Bentall et al. 2014). For example, abuse types characterised by psychological harm and humiliation may lead to low self-esteem, whereas events that disrupt attachment relationships (e.g. caregiver separation or loss) may lead to insecure attachment styles (Wickham, Sitko & Bentall, 2015). While the current evidence for specific pathways should not be overstated, burgeoning research in this area highlights the potential value of investigating associations between caregiver CEA and psychosis.

1.6. Caregiver antipathy

Caregiver emotional abuse is broadly defined as adverse behaviours from the parent/caregiving figure, occurring in sustained interactional patterns and inappropriate to the child's developmental needs (Thompson & Kaplan, 1996). As mentioned, these acts can be active or passive; and one construct developed

specifically to capture active forms of CEA within the home is *caregiver antipathy*; described as *'criticism, hostility, coldness or rejection shown by parent figures towards the child'* (Bifulco, Brown & Harris, 1994). This concept has led to measures being developed to assess this CEA sub-type; such as the Childhood Experience of Care & Abuse interview (CECA-I; Bifulco et al. 1994) and questionnaire (CECA-Q; Bifulco et al. 2005). These measures separately assess experiences of antipathy and neglect from the mother and father caregiving figures prior to age 17 years. Using this specific index of caregiver emotional abuse, studies have found associations with symptom severity in depression (Li, Carracher & Bird, 2020); anxiety disorders (Schimmenti & Bifulco, 2015) and eating disorders (Cardi et al., 2013). To date, no review has investigated associations of caregiver antipathy with psychosis. Findings in relation to this type of childhood emotional victimization are important for developing a more rigorous understanding of the impact of adverse caregiving in psychosis and identifying psychological mechanisms that could be targeted in therapeutic interventions.

1.7. Aims of the review

This review aimed to expand the current evidence relating to associations between CEA and psychosis, by focusing exclusively on a sub-type of caregiver emotional abuse that previous reviews have typically included within the larger domain of CEA Specifically, the review aimed to investigate if there is a relationship between caregiver antipathy and psychosis, provide a systematic, narrative review of existing research and critically evaluate the current evidence relation to the methodological quality of identified studies.

2. METHOD

2.1. Search strategy

This review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. 2009). The proposed methodology was specified beforehand and registered on the Prospective Register of Systematic Reviews (PROSPERO; protocol number: CRD42019125015). Searches were performed on Embase, MEDLINE and PsycINFO using the OVID interface. PubMed and Scopus were also searched. Google Scholar and citations of identified articles were hand-searched to source relevant articles that were not on the databases. The last search was conducted on 9th March 2020. To identify studies relevant to the review question, a list of search terms was developed using the Medical Subject Headings (MeSH) terms for 'Psychotic Disorders'. Search terms for caregiver antipathy were devised based on the definition by Bifulco, Brown & Harris (1994). This strategy was employed to ensure that as many studies as possible were captured that had assessed this specific abuse type. The list of key search terms for each database is presented in Table 1.

Table 1. List of key search terms.

Database	Key search terms
Ovid (Embase, Medline, PsychINFO)	((Psychotic* OR Psychosis* OR Schizophren* OR Hallucination* OR Delusion*) AND (Parent* OR Caregiver OR Family OR Maternal OR Mother OR Paternal OR Father OR Child*) AND (Antipathy OR Hostil* OR Reject* OR Critic* OR Cold*)). ti/ab.
PubMed	((Psychotic* [Title/Abstract] OR Psychosis* [Title/Abstract] OR Schizophren* [Title/Abstract] OR Hallucination* [Title/Abstract] OR Delusion* [Title/Abstract])) AND (Parent* [Title/Abstract] OR Caregiver [Title/Abstract] OR Family [Title/Abstract] OR Maternal [Title/Abstract] OR Mother [Title/Abstract] OR Paternal [Title/ Abstract] OR Father [Title/Abstract] OR Child* [Title/Abstract])) AND (Antipathy [Title/Abstract] OR Hostil* [Title/Abstract] OR

	Reject* [Title/Abstract] OR Critic* [Title/Abstract] OR Cold* [Title/ Abstract])).
Scopus	TITLE-ABS (psychotic* OR psychosis* OR schizophren* OR hallucination* OR delusion* AND parent* OR caregiver OR family OR maternal OR mother OR paternal OR father OR child* AND antipathy OR hostil* OR reject* OR critic* OR cold).

2.2. Inclusion/exclusion criteria

Studies were assessed for inclusion based on general characteristics, study design, sample characteristics and measures used to assess the key variables.

2.2.1. Inclusion criteria

Studies were included based on the following: (i) published in English; (ii) published in a peer-reviewed journal between January 1980-March 2020; (iii) empirical quantitative study (randomised controlled trials, controlled/uncontrolled cohort studies, prevalence studies, case control or cross-sectional studies); (iv) predominantly adult sample (mean age $\geq$18 years), with no participants <16 years; (v) clinical or general population samples; (vi) if using clinical samples, diagnosis of at least one psychosis-spectrum condition (schizophrenia, schizoaffective disorder, delusional disorder, brief psychotic disorder, first episode psychosis), (vii) used a self-report or clinician-rated measure of global/specific psychosis symptoms (including schizotypy dimensions); (viii) used a self-report measure of caregiver antipathy in childhood (prior to aged 16 years). All aspects of caregiver antipathy based on the definition by Bifulco et al. (1994) were included, which was any study that had assessed childhood experiences of criticism, hostility, coldness or rejection from caregiving figures. Lastly, studies were included if results reported a test of association between the psychosis and caregiver antipathy, irrespective of whether this was the primary study outcome.

2.2.2. Exclusion criteria

Studies were excluded according to the following (i) not an empirical quantitative design (qualitative studies; personal accounts; case studies; review articles, book chapters); (ii) grey literature (unpublished dissertations, conference abstracts, posters); (iii) used child/adolescent (<17 years) or older adult (>65 years) samples; (iv) final sample size of 10 or less participants; (v) if using clinical samples, had included participants with a diagnosis of bipolar affective disorder, substance-induced psychosis; post-partum psychosis or dementia; (vi) had not discriminated between current caregiver antipathy and experiences occurring prior to 16 years. Studies assessing experiences of expressed emotion (EE) in psychosis were excluded as this term typically reflects the quality of current family relationships and interactions rated by an interviewer (Vaughn & Leff, 1981).

2.3. Selection of eligible studies

In total, 3,187 articles were initially identified. An additional eleven articles were sourced through searches of reference lists and citations. This identified 1,925 articles after de-duplication which were screened against inclusion and exclusion criteria based on both titles and abstracts. At this stage, 10% (n = 193) of articles were evaluated by a second independent assessor to verify reliability of inclusion/ exclusion before full text screening, which yielded an agreement rating of 100%. Following this procedure, 52 articles potentially met inclusion criteria and were subject to full-text screening. On assessment of full-texts, 38 articles were excluded. At this stage, 10% (n = 6) papers, comprising three included and three excluded studies, were evaluated by an independent assessor to verify reliability of inclusion/ exclusion at the final stage. Five out of six papers were initially agreed upon and an agreement was reached on the final paper following clarification of the inclusion criteria. To verify reliability, an additional six papers

(10%), three included and three excluded, were evaluated by a second assessor, yielding a 100% agreement rate. In total, 14 articles were included in the final review. A four-phase PRISMA flow diagram outlining each stage of the review is shown in Figure 1.

2.4. Quality assessment

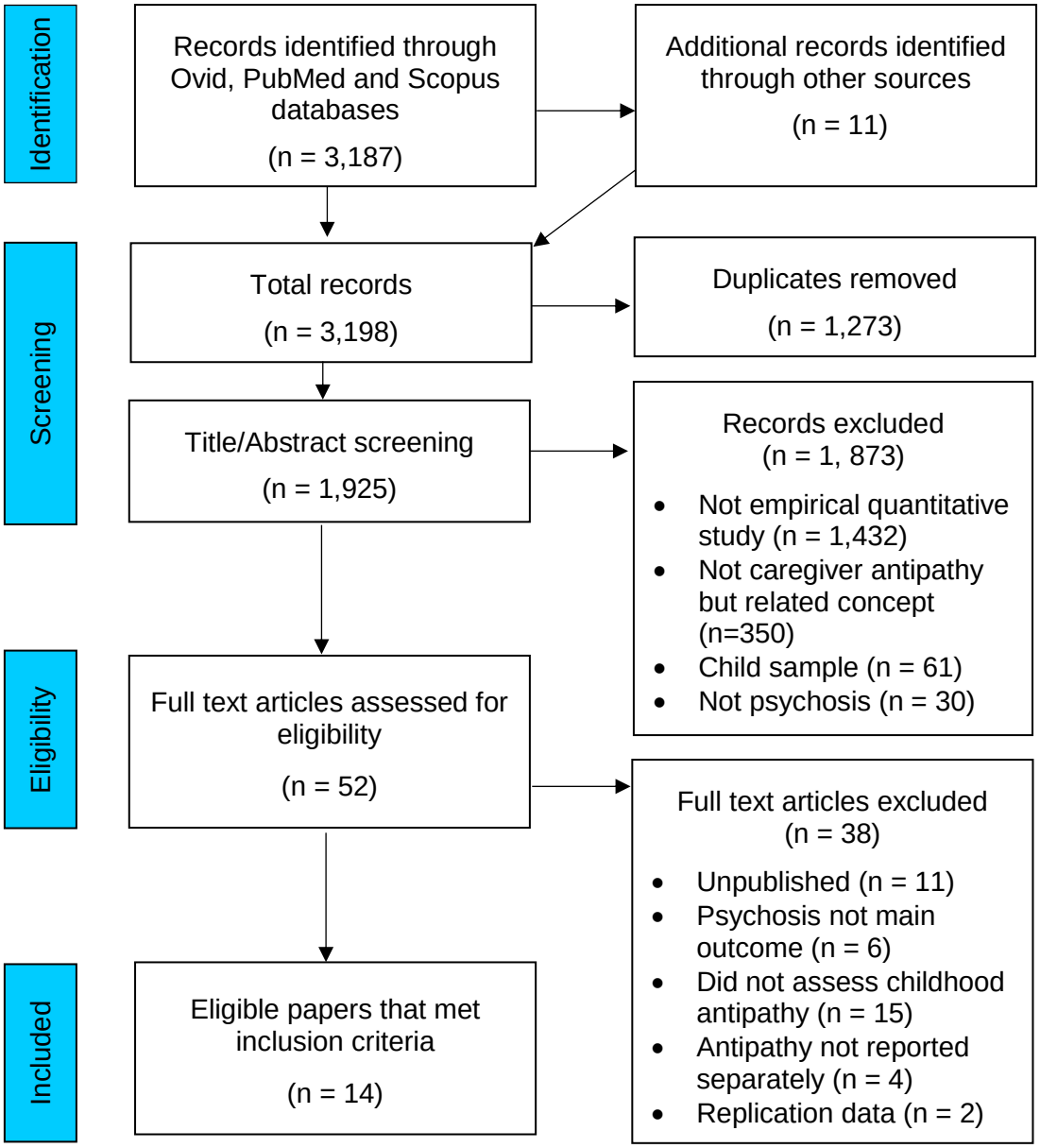
The methodological quality of included studies was assessed using the Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies (EPHPP, 2009). This tool was selected based on evidence that it is suitable to use for evaluating the quality of non-randomised studies (Evans, Lasen & Tsey, 2015) and is reported to have good content and construct validity (Armijo-Olivio et al., 2012). Adaptations to the tool were made by selecting the quality factors that fit with the inclusion criteria for the review. Quality factors were considered for inclusion by the author and primary supervisor; a specialist in the field of trauma and psychosis. From this process, six components were judged as critical for the quality evaluation of included papers: (1) Selection Bias; (2) Study Design; (3) Confounders; (4) Data Collection – Psychosis; (5) Data Collection - Caregiver Antipathy; and (6) Statistical Analysis. For each study, the six factors were assigned a rating of 1 = 'Strong'; 2 = 'Moderate'; or 3 = Weak, based on the quality criteria (Appendix 6.1). Overall quality scores were assigned according to the total number of 'Weak' ratings across the six components ('Strong' = 0 weak ratings; 'Moderate' = 1 weak rating; 'Weak' = 2 or more weak ratings). As the sixth factor (statistical analysis) is not included in the global quality rating in the EPHPP tool, an adaptation was made to reflect the suitability of the statistical methods for the study design; 'Weak' = Descriptive statistics only; 'Moderate' = Bivariate correlations or simple between group-comparisons; 'Strong' = Multivariate analyses controlling for relevant demographics. The EPHPP tool dictionary

(EPHPP, 2009) was used to clarify components and support the quality assessment process. All included papers were subjected to a double-rated quality evaluation by a second independent rater. Final agreement on the overall quality rating of the studies was 100%.

2.5. Interpretation of effect sizes

Effect sizes for each reported association of caregiver antipathy and psychosis were computed using standardised effect size conventions by Cohen (1988). As the majority of studies had employed correlational analyses, Pearson's *r* (Spearman's *Rho* for non-parametric studies) was used as the main outcome metric and effect sizes were reported accordingly (small = 0.10; medium = 0.30; large = 0.50). When not reported in the primary studies, Cohen's *d* was estimated from available descriptive statistics (means and standard deviations) and effect sizes were reported based on published criteria (small = 0.20; medium = 0.50; large = 0.80). In the case of studies reporting ANOVA for between-groups analyses; reported η^2 (Eta) values and sample sizes were used to estimate effect size based on Cohen's criteria (small = 0.01; medium = 0.05; large = 0.14). For studies reporting Odds Ratios (OR), these were converted into Cohen's *d* values to make the strength of effects more comparable across studies. Lastly, in the case of studies using multivariate regression, reported standardised Beta (β) values were converted to an *r* statistic (for β values between -0.50-0.50) or an f^2 statistic (for β values >0.50) based on recommendations by Peterson & Brown (2005). The f2 values were interpreted based on criteria by Cohen (small =0.1; medium = 0.25; large = 0.40). All effect size estimates were calculated using a standardised tool by Lenhard & Lenhard (2016).

Figure 1. Four-phase PRISMA flow diagram outlining the review process.



3. RESULTS

The systematic review yielded 14 studies that met the inclusion criteria (participant n = 1,848) and had outcomes assessing the relationship between caregiver antipathy and psychosis diagnosis or symptoms. Characteristics of the included studies are described in Table 3.

3.1.1. Study methodology and quality

Eight of the 14 studies were cross-sectional (seven within-subjects, one between-subjects) and the remaining six were case-control. Overall, seven studies obtained an overall 'weak' quality rating, five studies obtained a 'moderate' rating and two studies obtained a 'strong' rating. The most poorly met quality criteria was study design, as over half of the included studies (57%) used uncontrolled designs based on cross-sectional data. The second most poorly met quality criteria was adjustment of confounders in the analysis, as only six studies controlled for key demographic and clinical variables in the analysis. Quality criteria for assessment of caregiver antipathy was poorly met in over one third of studies, as valid/reliable data collection tools were not used. Scores across the six quality factors for each study are shown in Appendix 6.2.

3.1.2. Sample characteristics

Of the 14 studies reviewed, 12 (86%) were conducted in Europe (Turkey = 4 studies; UK = 3 studies; Portugal = 2 studies; Spain = 1 study; Greece = 1 study; Sweden = 1 study) and 2 studies were conducted in the USA. The mean age reported for the samples ranged from 18.5 - 43.5 years. Two studies included a small number of individuals aged 16 years in their FEP sample. All recruited mixed-sex samples; the percentage of male participants ranged from 22%-70%.

Just two studies reported sample ethnicity, with most participants categorised as White (65.1- 79.8 %). In total, eleven studies recruited clinical samples with schizophrenia-spectrum diagnosis; seven included participants with an ICD or DSM diagnosis of Schizophrenia, two only included individuals with a DSM-IV diagnosis of Paranoid Schizophrenia and two studies only included individuals with an ICD-10 diagnosis of First Episode Psychosis (FEP). The remaining three studies recruited non-clinical samples from undergraduate student populations.

3.3. Assessment measures

3.3.1. Psychosis diagnosis

Of the 11 studies using clinical samples, eight (73%) specified that at least one validated measure was used to confirm diagnosis; three used the Positive and Negative Symptom Scale (PANSS) (Kay, Fiszbein, & Opler, 1987), two used the Scales for the Assessment of Positive and Negative Symptoms (SAPS/SANS) (Andreasen & Grove, 1986), two used the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) (WHO, 1992) and one study used the Psychotic Symptom Rating Scale (PSYRATS) (Haddock et al. 1999). These measures take the form of semi-structured interviews conducted by a researcher who assigns scores for each symptom domain. Overall, two studies did not specify if they had employed a direct assessment of psychosis symptoms to confirm diagnosis and received a weak rating for the data collection quality factor.

3.3.2. Psychosis symptoms

Ten studies measured relationships between psychosis symptom severity and caregiver antipathy. Measures of psychosis symptoms within and between

individual studies showed sizeable heterogeneity due to the various recruitment strategies used and differences in schizophrenia-spectrum diagnoses.

Of the seven studies using clinical samples, one study reported global symptom severity on the SCAN, four studies reported total positive symptom severity on the SAPS/PANSS; and one study reported total negative symptom severity on the SANS. Two studies employed a measure of specific symptoms; one reported auditory hallucination severity on the PSYRATS and appraisals on the Beliefs About Voices Questionnaire (BAVQ) (Chadwick & Birchwood, 1995). Lastly, one study reported paranoia severity on the General Paranoia Scale (GPS; Fenigstein & Vanable, 1992) and Paranoia Checklist (PC) (Freeman et al., 2005). All these studies received a strong rating for the psychosis data collection quality factor as they used at least one measure deemed to be valid and reliable.

Of the three non-clinical studies, one study reported global positive symptoms on the Comprehensive Assessment of At-Risk Mental States (CAARMS) (Yung et al., 2005) and paranoid and schizotypal PD traits on the Structured Clinical Interview for DSM-V (SCID; APA, 2013). Two studies employed a schizotypy measure; one reported persecutory ideation and perceptual aberration severity on the Minnesota Multiphasic Personality Inventory (MMPI) (Ben-Porath & Tellegan, 2008) and one reported perceptual aberration and physical anhedonia severity using measures of psychosis proneness (Chapman, Edell & Chapman, 1980). Two of these studies used valid/reliable measures to assess psychosis symptoms and were given a strong rating for the quality factor, however one study was rated weak as the measure was used before the psychometric properties were formally established (Chapman, Chapman & Kwapil, 1995).

3.3.3. Caregiver antipathy

Five measures were used to assess caregiver antipathy across the fourteen studies. The most common measure was the CECA-Q (Bifulco et al. 2005), used by five studies. One study used the CECA-I (Bifulco, 1994) in an interview format. Four studies reported maternal and paternal antipathy severity, one study reported paternal antipathy only, and one reported total parental antipathy. All studies that used the CECA received strong ratings for this quality factor as the measure has well established psychometrics (Bifulco, 1994; Bifulco et al. 2005).

Two self-report measures were used to assess perceptions of caregiver rejection in childhood. Four studies used the Egna Minnen Betraffande Uppfostran ('My Memories of Upbringing') Questionnaire (EMBU) a measure developed in Sweden by Perris et al. (1980). Two studies reported mother and father rejection severity and two reported total parental rejection. One study used the original Swedish language version with established validity/reliability. Three studies used adapted language versions of the EMBU (English = 2 studies; Turkish = 1 study), two of which described the psychometric properties of the measure and received a 'strong' rating on this quality factor, and one study that was given a weak rating as the validity/reliability of the English version was not described. Three studies used the adult version of the Parental Acceptance-Rejection Questionnaire (PARQ-A; Rohner, 2005) to assess caregiver rejection; two reported total parental rejection severity and one reported maternal and paternal rejection separately. These studies all received weak ratings for the antipathy data collection quality factor, as they used an adapted Turkish language version of the PARQ-A which was not described as valid or reliable.

Lastly, one study used the Childhood Experiences Scale (Frank & Paris, 1981) to assess caregiver criticism, and reported both maternal and paternal criticism. There is some evidence of construct validity of the CES, however as there is no robust evidence for validity or reliability of the scale as a measure of caregiver criticism, this study received a weak rating for this quality factor.

3.4. Synthesis of review findings

3.4.1. Studies that did not find an association between caregiver antipathy and psychosis

Overall, two studies did not support an association between caregiver antipathy and psychosis. Fisher et al. (2011) found no association between global symptom severity on the SCAN and paternal antipathy on the CECA-Q in an FEP sample (d = 0.002). Maternal antipathy was not reported. In addition, Akün et al. (2018) found, in a sample of adults with schizophrenia, no significant correlations between severity of mother's hostility/rejection and positive symptom severity on the SAPS (hostility, r = 0.15; rejection, r = 0.16). Similarly, no significant correlations were found between father's hostility/rejection and positive symptoms (hostility, r = 0.02; rejection, r = 0.01).

Both studies were rated to have moderate selection bias as they were non-randomized in their recruitment methods. Both used a reported a measure of global symptom severity only. There were some issues with the validity of measures used to assess caregiver antipathy. Akün et al. (2018) employed a Turkish language version of the PARQ-A but did not describe the psychometric properties of the measure. Fisher et al. (2011) included adolescents aged 16 years in their sample and assessed caregiver antipathy using the CECA-Q. As

this measure is only validated for use in adults aged 18 years and above, this could have affected the validity of the results. In addition, both studies were cross-sectional, used correlational or simple between-groups tests and had modest sample sizes (n = 53-84). Thus, the non-significant findings could represent the studies being underpowered to detect genuine effects.

3.4.2. Studies that found an association between caregiver antipathy and psychosis

Twelve studies reported significant associations of caregiver antipathy with psychosis. Effect size interpretations for each study are outlined in Table 2.

3.4.1.1. Studies that found small associations

Four studies found significant associations between caregiver antipathy and psychosis corresponding to a small effect size. In a non-clinical sample, Sheinbaum et al. (2015) found a small positive correlation between parental antipathy severity on the CECA-Q with global positive symptoms (r = 0.22) on the CAARMS, and schizotypy symptoms (r = 0.23) and paranoia severity (r = 0.25) on the SCID. Overall total, three of these studies used clinical samples; Skagerlind et al., 1996) found a small association between the severity of maternal (d = 0.35) and paternal rejection (d = 0.32) on the EMBU when adults with schizophrenia were compared to non-clinical controls. Akün (2017) found a small effect of maternal (η^2 = 0.06) and paternal rejection (η^2 = 0.04) on the PARQ-A when individuals with schizophrenia were compared to non-clinical controls, but no effects were found when the schizophrenia group were compared to a social anxiety disorder group (η^2 = 0.00). Lastly, Fisher et al. (2010) found a small effect of maternal antipathy on FEP diagnosis when the clinical sample were compared to non-clinical controls on the CECA-Q (unadjusted OR = 2.15,

d = 0.42). This association was not sustained when physical and sexual abuse were included in multivariate analyses, however the adjusted test statistic corresponded to a small effect size (adjusted OR = 2.07, *d* = 0.40). No significant association between paternal antipathy and FEP diagnosis was found (OR = 0.9, *d* = 0.06). Lastly, antipathy from both caregivers was more strongly associated with FEP (adjusted OR = 2.1, *d* = 0.41) compared to antipathy from one parent (adjusted OR = 1.4, *d* = 0.19), although both corresponded to a small effect size.

These four studies ranged in study quality (weak = 1 study, medium = 2 studies, strong = 1 studies). All but one employed case-control designs and used representative clinical samples of adults with schizophrenia-spectrum diagnoses, receiving moderate to strong quality ratings for the sample selection quality factor. All studies employed simple univariate tests and the majority (75%) controlled for relevant demographic confounders. All studies had moderate to large sample sizes (*n* = 214-428) and may have been better powered to detect genuine effects than those studies that did not identify any effects.

3.4.2.2. Studies that found moderate associations

Six studies found significant associations between caregiver antipathy and psychosis corresponding to a medium-sized effect. Two non-clinical studies found relationships relating to positive schizotypy domains. In an undergraduate sample, Baker & Hoerger (2012) found moderate, positive correlations of total parental rejection severity on the EMBU with the severity of persecutory ideation (*r* = 0.43) and aberrant experiences (*r* = 0.31) on the MMPI-2. Similarly, Edell & Kaslow (1991) found associations between severity of maternal (*d* = 0.71) and paternal criticism (*d* = 0.54) on the CES with perceptual aberration scores using scales of psychosis-proneness. No significant associations between caregiver

criticism and physical anhedonia were found, these still corresponded to medium-sized effects (maternal criticism, *d* = 0.42, paternal criticism, *d* = 0.27).

Two clinical studies found moderate associations of caregiver antipathy with global psychosis symptom severity on the PANSS. McCreadie et al. (1994) found significant, positive correlations between caregiver rejection on the EMBU with positive symptom severity (mother's rejection, *r* = 0.39; father's rejection, *r* = 0.40). Significant correlations were also found for general symptom severity (mother's rejection, *r* = 0.42; father's rejection, *r* = 0.45). Small positive correlations were found between caregiver rejection and negative symptoms that did not reach statistical significance (mother's rejection, *r* = 0.29; father's rejection, *r* = 0.23), however corresponded to a small effect size. Similarly, Chatziioannidis et al. (2019) found, in a sample of adults with schizophrenia, moderate, positive correlations between maternal antipathy severity on the CECA-Q with global positive symptoms (*r* = 0.35) on the PANSS, but no significant correlations were found for maternal antipathy with negative symptoms (*r* = 0.05) or cognitive symptoms (*r* = 0.13). Father's antipathy was not significantly correlated with any psychosis symptom domain (r = -0.01-0.19), however in between-groups analyses, individuals with schizophrenia had significantly higher odds of reporting antipathy from the father than non-clinical controls (OR = 7.7, *d* = 0.60). Between-groups effects could not be calculated for maternal antipathy as there were no cases of severe antipathy from the mother reported in the control group.

Two studies assessed specific relationships of caregiver antipathy with auditory hallucinations in clinical samples. Chatziioannidis et al. (2019) found a moderate positive correlation between maternal antipathy on the CECA-Q and auditory hallucinations on the PANSS (*r* = 0.40) in adults with schizophrenia. No significant

correlations were reported for paternal antipathy (r = 0.19). Conversely, Carvalho et al. (2015) found no significant correlations between caregiver antipathy and auditory hallucinations (maternal antipathy, r = 0.13; paternal antipathy, r = 0.09) in individuals with paranoid schizophrenia. However, moderate positive correlations were found for maternal antipathy with appraisals of voice source (r = 0.34) and paternal antipathy with voice malevolence (r = 0.43) and omnipotence (0.31) on the BAVQ. Paternal antipathy was found to be the strongest predictor of voice malevolence in the multivariate models (β=0.33, r = 0.38), which corresponded to a medium-sized effect.

One study assessed specific relationships of caregiver antipathy with paranoia severity in adults with paranoid schizophrenia. Carvalho et al. (2016) found, in multivariate analyses that controlled for demographic variables and depression, that severity of paternal antipathy, as rated by the CECA-Q, was a specific predictor of paranoia severity (β=0.40, r = 0.45), frequency (β=0.18, r = 0.23) and conviction (β=0.15, r = 0.20) on the GPS, whereas maternal antipathy was a specific predictor of paranoia distress (β=0.17, r = 0.22). No significant associations were found between caregiver antipathy and psychosis when the schizophrenia group was compared to non-clinical relatives (β values < 0.01).

Overall, these six studies were all assigned weak or moderate quality ratings. They generally scored weak-moderate ratings on sample bias as they used self-selecting samples, did not describe their recruitment procedure or recruited from a narrow pool of participants. For example, the two non-clinical studies (Baker & Hoerger, 2012; Edell & Kaslow, 1991) recruited self-selecting samples of undergraduate students and Carvalho et al. (2015; 2016) only recruited individuals with a DSM-IV diagnosis of paranoid schizophrenia. These studies used a range of self-report and interview measures to assess psychosis

symptoms and all but one received a strong rating for this data collection quality factor. Caregiver antipathy was also assessed using a range of measures, and whilst the majority of studies described the psychometric properties of the tool, the two older studies did not (Edell & Kaslow, 1991; McCreadie et al. 1994). Most studies reported separate associations for maternal and paternal antipathy, except one that reported a composite variable (Baker & Hoerger, 2012). Overall, four of these studies used correlations or simple between-groups tests to assess relationships between caregiver antipathy and psychosis, only one that adjusted for relevant demographic confounders (Edell & Kaslow, 1991).

3.4.2.3. Studies that found large associations

Two studies found relationships of caregiver antipathy with psychosis that corresponded to a large effect size. Akün & Batıgün (2019) found, in a sample of adults with schizophrenia, that caregiver rejection emerged as a significant predictor of total negative symptom severity on the SANS (mother's rejection, β=1.23, *f2* = 0.63; father's rejection, β = 1.97, *f2* = 0.80) when gender and psychological maladjustment severity (using the Personality Assessment Questionnaire; PAQ, Rohner & Khaleque, 2005) were controlled for in the multivariate analyses. Of note, when initial correlational analyses were conducted, negative symptom severity was not significantly correlated with rejection from the mother (*r* = 0.14) or the father (*r* = 0.03).

Lastly, Aydin et al. (2019) found a large effect of parental rejection severity with psychosis when adults with schizophrenia were compared to their siblings (*F*= 0.91) and non-clinical controls (*F*= 0.70). Similarly to the Akün & Batıgün (2019) study, when correlational analyses were performed, parental rejection severity

was not correlated with positive (r = 0.05), negative (r = 0.11) or general symptoms (r = 0.03) on the PANSS.

Of the studies that found associations corresponding to a large effect size, one study received an overall weak rating and one study received a strong rating in the quality assessment. Both recruited samples of adults with schizophrenia from the community and received moderate ratings for the selection bias quality factor as they were referred from one source only and not randomly selected from a wider pool of potential participants. One study was cross-sectional (Akün & Batıgün, 2019) and one was case-control (Aydin et al. 2019) so these studies received weak and moderate ratings for the study design quality component respectively. Both used valid and reliable measures to assess psychosis, and reported a direct measure of global symptoms severity, so received strong ratings on this quality factor. Both studies used a measure of caregiver rejection adapted for use in a Turkish population; one study described the psychometric properties of the measure (Aydin et al. 2019) and one did not (Akün & Batıgün, 2019), indicating variation in the validity of assessment measures used to capture childhood experiences of caregiver rejection. Lastly, both studies had small sample sizes (52 and 99 participants) which may have yielded larger effect sizes in the statistical analysis compared to studies with bigger samples.

Table 2. Characteristics and results of included studies (n = 14)

Author, date, country	Study design	Sample type	Setting	N total	Sub-group N	Age, M (SD)	Male %	Antipathy measure	Psychosis measure	Analysis	Main (relevant) findings	Effect size
Akün (2017); Turkey	Case-control	Schizophrenia (DSM-V)	Community	251	SZ: 53 SAD: 51 HC: 147	SZ: 38.3 (10.6) SA: 38.6 (11.4) HC: 35.7 (10.8)	SZ: 62.3 SAD: 41.2 HC: 37.4	PARQ-A (Turkish)	-	ANOVA	SZ sig. higher MR (η^2 = 0.06) and FR (η^2 = 0.04) than HC. No b-g diffs for SZ/SA (η^2 < 0.00).	SMALL (η^2)
Akün & Batıgün (2019); Turkey	Cross-sectional (w-s)	Schizophrenia (DSM-V)	Community	52	-	38.3 (10.7)	61.5	PARQ-A (Turkish)	SANS	Multiple regression	Sig. effect of MR/FR on neg. symps adjusting for gender and maladjustment (MR β=1.23, f^2=0.63; FR β=1.97, f^2=0.80).	LARGE (β/f^2)
Akün et al. (2018); Turkey	Cross-sectional (w-s)	Schizophrenia (DSM-V)	Community	53	-	38.2 (10.6)	62.3	PARQ-A (Turkish)	SAPS	Correlations	Positive symptoms not sig. correlated with MH/MR (*r* = 0.15; *r* = 0.16), or FH/FR (*r* = 0.02; *r* = 0.01).	NONE (*r*)
Aydin et al. (2019); Turkey	Case-control	Schizophrenia (DSM-V)	Community	99	SZ: 34 HS: 34 HC: 31	SZ: 30.1 (7.4) HS: 31.5 (9.5) HC: 29.7 (7.2)	SZ: 64.0 HS: 41.0 HC: 41.0	EMBU (Turkish)	PANSS	ANOVA	SZ sig. higher PR than HS (*F*= 0.91) & HC (*F*= 0.7). NS for HS/HC (*F* =0.10)	LARGE (*F*)
Baker & Hoerger (2012); USA	Cross sectional (w-s)	Non-clinical (students)	-	286	-	19.7 (2.1)	34.9	EMBU (English)	MMPI-2	Correlations	PR sig. correlated with persecutory ideas (*r* = 0.43) and aberrant experiences (*r* = 0.31).	MEDIUM (*r*)
Carvalho et al. (2015); Portugal	Cross-sectional (w-s)	Paranoid Schizophrenia (NR)	NR	48	-	43.3 (13.2)	37.5	CECA-Q	PSYRATS BAVQ	Correlations Multiple regression	MA sig. correlated with BAVQ voice source (*r* = 0.34 and FA with malevolence (*r* = 0.43) & omnipotence (*r* = 0.31). FA strongly predicted voice malevolence (β=0.33, *r*=0.38).	MEDIUM (*r*, β)
Carvalho et el. (2016); Portugal	Case control	Paranoid Schizophrenia (NR)	NR	187	SZ: 91 HR: 32 HC: 64	SZ: 42.5 (12.8) HR: 55.6 (13.0) HC: 45.2 (17.3)	SZ: 73 HR: 25 HC: 67	CECA-Q	GPS PC	MANCOVA	FA (β= 0.40, *r* = 0.45) and MA (β= 0.24, *r* = 0.29) sig. predicted paranoia severity. FA predicted frequency (β = 0.18, *r* = 0.23) & conviction (β = 0.15, *r* = 0.20). MA sig. predicted distress (β=0.17, *r* = 0.22). No sig b-g diffs when depression included (β values <0.01).	MEDIUM (β/*r*)
Chatziioannidis et al. (2019); Greece	Case-control	Schizophrenia (DSM-IV)	Inpatient	124	SZ: 63 HC: 61	SZ: 40.4 (10.0) HC: 39.3 (9.6)	SZ: 69.8 HC:70.5	CECA-Q	PANSS	Correlations Chi squared tests	MA sig correlated with total positive symptoms (*r* = 0.35) and AH (*r* = 0.40). FA NS with positive symptoms (*r* = 0.16) and AH (*r* = 0.19). SZ higher odds of FA (OR= 7.7, *d* = 0.60) than HC. MA NR*.	MEDIUM (r/OR)

Edell & Kaslow (1991); USA	Cross-sectional (b-s)	Non-clinical (students)	-	79	PAn: 21 PAb: 29 HC: 29	18.5 (NR)	PAn:47.6 PAb:48.3 HC: 51.7	CES	PPS	t-tests	PAb reported sig. higher MCr (*d* = 0.71) and FCr (*d* = 0.54) than HC. No sig. diffs between PAn & HC on MCr (*d* = 0.42) or FCr (*d*=0.27).	MEDIUM (*d*)
Fisher et al. (2010); UK	Case-control	First Episode Psychosis (ICD-10)	Mixed	428	FEP:182 HC: 246	FEP: 31.0 (11.3) HC: 39.0 (12.7)	FEP: 53.8 HC: 41.9	CECA-Q	SCAN	Logistic regression	FEP reported more severe MA than HC (OR = 2.15, *d* = 0.42). NS controlling for other traumas (OR = 2.07, *d* = 0.40). NS for FA (OR = 0.9, *d* = 0.06). Antipathy from both caregivers more strongly associated with FEP (OR = 2.1, *d* = 0.41) than antipathy from one parent (OR = 1.4, *d* = 0.19).	SMALL (OR/*d*)
Fisher et al. (2011); UK	Cross-sectional (w-s)	First Episode Psychosis (ICD-10)	Mixed	84	-	31.0 (12.1)	56.0	CECA-Q	SCAN	Mann-Whitney U	FA not sig. associated with global symptom severity (*d* = 0.002). MA NR.	NONE (*d*)
McCreadie et al. (1994); UK	Cross-sectional (w-s)	Schizophrenia (ICD-9)	Mixed	50	-	37.8 (10.5)	64.0	EMBU (English)	PANSS	Correlations	MR sig. correlated with positive (*r*=0.39), negative (*r*= 0.29) and general (*r*= 0.42). FR sig. correlated with positive *(r* =0.40) general (*r*=0.45) but not negative (*r*=0.23) symptoms.	MEDIUM (*r*)
Sheinbaum et al. (2015); Spain	Cross-sectional (w-s)	Non-clinical (students)	-	214	-	21.4 (2.4)	22.0	CECA-I	CAARMS SCID	Correlations	PA correlated with positive symptoms (*r* = 0.22), paranoid PD traits (*r* = 0.25) and schizotypy (*r* = 0.23).	SMALL (*r*)
Skagerlind et al. (1996); Sweden	Case-control	Schizophrenia (DSM-III)	Inpatient	262	SZ: 57 HC: 205	SZ: 29. 2 (7.3) HC: 24.9 (8.6)	SZ: 53.0 HC: 58.0	EMBU (Swedish)	-	t-tests	SZ group reported sig. higher MR (*d* = 0.35) and FR (*d* = 0.32) than HC.	SMALL (*d*)

Notes: ***Design:*** Between-subjects *(b-s);* Within-subjects (w-s); ***Sub-group:*** First Episode Psychosis (*FEP*); Healthy Controls (*HC*); Healthy Relatives (*HR*); Healthy Siblings (*HS*); Perceptual Aberration (*PAb*); Physical Anhedonia (*PAn*); Social Anxiety Disorder (*SAD*); Schizophrenia *(SZ)*. ***Antipathy measure:*** Childhood Experiences of Care and Abuse Interview (*CECA-I*); Childhood Experiences of Care and Abuse Questionnaire (*CECA-Q*); Childhood Experience Scale (*CES*); Egna Minnen Betraffande Uppfostra (*EMBU*); Parental Acceptance–Rejection Questionnaire – Adult (*PARQ-A*). ***Psychosis measure:*** Beliefs About Voices Questionnaire (*BAVQ*); Comprehensive Assessment of At-Risk Mental States (*CAARMS);* General Paranoia Scale (*GPS*); Minnesota Multiphasic Personality Inventory – 2nd Edition (*MMPI-2*); Paranoia Checklist (*PC*); Positive and Negative Syndrome Scale (*PANSS*); Psychosis Proneness Scales (PPS); Psychotic Symptom Rating Scales (PSYRATS); Scale for the Assessment of Negative Symptoms (*SANS*); Scale for the Assessment of Positive Symptoms (*SAPS*); Schedules for the Clinical Assessment of Neuropsychiatry (*SCAN*); Structured Clinical Interview for DSM-V (*SCID*). ***Main (relevant) findings: Antipathy:*** Father Antipathy (FA); Father Criticism (FCr); Father Rejection (FR); Mother Antipathy (MA); Mother Criticism (MCr); Mother Rejection (MR); Parental Antipathy (PA); Parental Rejection (PR); ***Effect size:*** Not Reported (*NR*); Non-Significant (*NS*); *OR not calculated as no 'severe' cases in control group.

4. DISCUSSION

4.1. Summary of findings

To date, this is the first systematic review to investigate associations between childhood caregiver antipathy and psychosis. The review identified 14 studies that tested this relationship, of which the majority found a significant relationship between recollections of caregiver antipathy, criticism or rejection in childhood and psychosis symptoms or diagnosis in adulthood. Overall, four studies found an association corresponding to a small effect size, six studies found a medium effect and two studies found a large effect. The quality assessment showed high methodological variation across the studies, most notably in relation to sample size and type, whether psychosis diagnosis or symptoms were reported, and on controlling for other victimisation types. Whilst this means that caution is needed in interpreting the results, the current evidence does appear to show a relationship between caregiver antipathy and psychosis, indicating that more methodologically robust studies are required.

4.2. Caregiver antipathy and psychosis diagnosis

Associations were found between caregiver antipathy and schizophrenia-spectrum diagnoses. These results tended to come from moderate-strong quality studies using case-control designs (i.e. those comparing antipathy severity between different groups) and yielded small effects when adults with schizophrenia were compared to non-clinical groups. Only one study (Akün, 2017) used another clinical sample as a comparison group and found no differences between individuals with schizophrenia and social anxiety disorder diagnoses on maternal and paternal rejection severity. This could be

interpreted in line with the view that caregiver emotional abuse is likely to have a global impact on adverse mental health outcomes (Dias et al. 2015; Vachon et al. 2015) and may impact non-specific anxiety processes found in people with social anxiety disorder and psychosis (Birchwood et al. 2007). However, this idea has not yet been tested specifically in relation to caregiver emotional abuse and further work is required in this area.

4.3. Caregiver antipathy and psychosis symptoms

Associations were also found between caregiver antipathy and psychosis symptoms. These were generally weak or moderate quality studies using cross-sectional designs (i.e. those assessing relationships between antipathy and symptom severity at one time point), and tended to yield medium effect sizes. Most studies reported a measure of global psychosis symptoms (i.e. total positive, negative or general symptoms) though three reported specific symptoms which merits further discussion.

4.3.1. Hallucinations

Two studies found associations of caregiver antipathy with hallucination severity in individuals with a diagnosis of schizophrenia, including total hallucination severity (Carvalho et al. 2015) and appraisals about voices (Chatziioannidis et al. 2019). This suggests that this type of CEA may impact both the occurrence and phenomenology of voices. This could map onto cognitive models of voice hearing, which propose that the thematic content of, and relationship to, voices tend to mirror broader patterns of social relating in individuals exposed to caregiver abuse (Hayward, Berry & Ashton, 2011) and feed into other cognitive and affectual processes implicated in voice formation

(Alderson-Day & Fernyhough, 2016). However, further work is needed to examine specific links between caregiver antipathy and hallucinations.

4.3.2. Persecutory delusions/paranoia

Additionally, there was evidence of associations between caregiver antipathy and paranoid/persecutory ideas in non-clinical samples and paranoia severity in adults with schizophrenia. This supports existing accounts that propose a relationship between CEA and paranoia (Ashcroft, Kingdon & Chadwick, 2011; Bentall et al. 2014). Additionally, there was some evidence that insecure attachment mediated relationships between caregiver antipathy and paranoia. This lends tentative support to a role of caregiver antipathy in the formation of insecure attachment-related beliefs in paranoia (Berry, Varese & Bucci, 2017; Hardy, 2017) and builds on the literature by focusing specifically on the impact of caregiver emotional abuse highlighted within attachment models of psychosis (Barker, Gumley, Schwannauer & Lawrie, 2015).

4.4. Strengths and Limitations

The strengths of this review should first be acknowledged. This is the first review to focus on a specific type of caregiver emotional abuse in psychosis. This addresses the limitations of previous reviews of childhood trauma and psychosis, which typically include a global measure of CEA that does not separate emotional abuse from emotional neglect or differentiate between emotional abuse experienced inside or outside the home. The synthesis of empirical research findings across a large number of participants provides some insight into the current evidence base which indicate a role of caregiver antipathy in psychosis and may be tested in future studies using high-quality

methodology. The review also used a comprehensive search strategy in line with PRISMA reporting guidelines and was subject to an independent double-rated evaluation, which lends support to the validity of the review.

Limitations of the primary studies should be considered. First, the quality assessment showed that almost all studies used recruitment strategies based on self-selection and convenience sampling; and only two studies reported how many participants who were approached agreed to take part. The issue of selection bias is problematic as it does not allow us to identify whether participants were representative of the settings they were recruited from. This may be particularly relevant within trauma and psychosis research, as clinical samples of adults with psychosis may under-report childhood abuse (Read et al. 2005) which could have impacted or limited participation across the studies.

Second, the majority of studies used cross-sectional designs and were correlational, so firm conclusions cannot be drawn about whether there is a causal relationship between caregiver antipathy and psychosis. Additionally, potential demographic confounders were not included in many analyses. For example, just two studies reported the ethnicity of their samples (Fisher et al. 2010; 2011). This data would have enhanced the interpretation of results and may be an area for future research, particularly in the context of cross-cultural variations in expression of care. For example, caregiver criticism may be more tolerated in some cultures, leading to greater use of emotional discipline strategies through mechanisms such as humiliation, guilt or shame, which may be considered emotionally abusive in other cultures (Stoltenberg et al. 2012).

This will likely impact self-reported exposure to CEA and will be an important factor to consider in future studies of caregiver emotional abuse in psychosis.

A further limitation is that, as most studies did not control for other childhood trauma types, or identify patterns of co-occurrence, it is difficult to establish the relative contribution of caregiver antipathy on psychosis diagnosis or symptoms. It is therefore not possible to conclude whether the strength of effects found in the review are over and above those that might have been found for other forms of caregiver abuse. This is important given that CEA is likely to feature heavily in other forms of victimisation (Debowska et al. 2017) and there is a high co-occurrence between caregiver emotional abuse and emotional neglect (Turner et al. 2020). Further investigation using more rigorous methodology is needed in order to draw more robust conclusions about the predictive value of caregiver antipathy on psychosis. The best way to achieve this would be through the use of multivariate methods, whereby the effect of each trauma variable would be evaluated in relation to its overall variance in psychosis outcome/symptom severity. As only three studies used multiple regression, there was not enough data to compare the strength of associations between caregiver antipathy and psychosis with other trauma variables, which could be another key area for future reviews.

Limitations of the review should also be acknowledged. First, the strength of association between the variables of interest were estimated based on the data available for effect sizes to be computed. This may have introduced error into the results and estimates of effect sizes across studies may not be directly comparable. In addition, the inclusion criteria for the assessment of caregiver antipathy was based on one definition by Bifulco, Brown & Harris (1994). The

CECA, which is the only validated measure used to capture this abuse construct, was used in under half the studies. The remaining studies used tools to assess caregiver rejection or criticism, a number of which were not psychometrically validated, which compromises the validity and limits the generalisability of the findings.

Lastly, the limitations of the quality assessment tool used in this review should be noted. The EPHPP assesses the internal/external validity of various aspects of a study, however it may be less sensitive than other quality assessment tools as it uses a broader scale and fewer quality factors (Armijo-Olivo et al. 2012). An example is that all studies in the current review received weak or moderate ratings on the study design quality domain, as the EPHPP automatically assigns a weaker score to non-randomised studies. However, over half of the studies used secondary data analysis from wider randomised trials. This means that some of the nuanced information about the methodological characteristics of these studies was lost, which makes it more difficult to draw robust conclusions about the validity and reliability of evidence across individual studies.

4.5. Implications for clinical practice

Clinical services for people with psychosis should consider the nature and impact of caregiver emotional abuse in symptom severity, content and distress maintenance. Good practice is the use of an individual, formulation-based approach, considering possible cross-cultural influences, and focusing on the delivery of psychological therapies and social support within a trauma-informed framework. Such approaches may focus on helping an individual to

cope with or resolve the impact of adverse caregiving experiences in childhood, which may help to facilitate sustainable improvements in positive symptoms and reduce rates of re-victimisation that people with psychosis commonly report (van den Berg et al., 2016).

4.6. Directions for future research

The review findings may be used to inform future research in several ways. First, although it did not specifically investigate this, previous research has demonstrated considerable overlap between caregiver antipathy and emotional neglect, and it is therefore important for empirical studies to assess these separately to account for the possible shared variance between them. Further research integrating comprehensive assessments of caregiver antipathy is required to clarify the potential mechanisms through which this victimisation sub-type may uniquely impact psychosis outcomes. Future studies would also benefit from looking at whether there are differential effects of emotional victimisation inside versus outside of the home (e.g. caregiver victimisation versus peer bullying) given that abuse within the home may represent a greater violation of relational safety and thus have a more detrimental impact in psychosis (Taillieu et al., 2016). Next, the findings indicate the need for more longitudinal research to clarify possible bidirectional associations between caregiver antipathy and transition to psychosis, as well as relationships with trauma symptoms. This should include more rigorous and valid assessment of caregiver antipathy, psychosis and post-traumatic stress symptoms to assess possible differential relationships and identify possible psychological mechanisms based on recent models (Hardy et al. 2017; 2020).

4.7. Conclusions

Findings from the review point to a potential association of caregiver antipathy in childhood and psychosis diagnosis/symptoms in later life. However, this raises important questions about whether this specific form of caregiver abuse is independently associated with psychosis or is part of a broader pattern of abuse and neglect within the home. Further research is needed to apply more rigorous and valid assessment of caregiver antipathy, control for the effects of other childhood victimisation types and assess specific relationships with certain symptoms, as well as identifying potential mediating mechanisms that may be targeted in psychological interventions for people with psychosis.

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6. APPENDICES

Appendix 6.1. EPHPP quality rating assessment tool

Score	Sample/ Selection Bias	Design	Confounders	Data collection Psychosis	Data collection – Caregiver Antipathy	Statistical analysis
Weak	Self-referred (e.g. university sample, snowball sampling)	Any other method or did not state the method used.	Important differences found between groups ***and*** <60% controlled for ***or*** confounders not described.	Data collection tool has not been shown to be valid or both reliability and validity are not described	Data collection tool has not been shown to be valid or both reliability and validity are not described	Descriptive statistics only
Moderate	Referred from a source in a systematic manner (e.g. hospital or clinic)	Cohort analytic studies, case control studies, cohort designs, interrupted time series.	Significant differences found between groups and controlled for 60-79% of relevant confounders	Data collection tool has been shown to be valid ***and*** not reliable ***or*** reliability is not described	Data collection tool has been shown to be valid ***and*** not reliable ***or*** reliability is not described	Bivariate correlations; simple between-group/linear tests
Strong	Participants randomly selected from a comprehensive list of individuals in the target population	Randomised Controlled Trial ***or*** Controlled Clinical Trial (CCT)	No significant differences between groups ***or*** controlled for ≥80% of relevant confounders	Data collection tool has been shown to be valid ***and*** reliable (e.g. standardised diagnostic interview)	Data collection tool has been shown to be valid ***and*** reliable (e.g. validated questionnaire)	Multivariate tests also controlling for relevant demographics

Appendix 6.2. EPHPP quality ratings for included studies

Study	Selection bias	Study design	Confounders	Data Collection Psychosis	Data Collection Antipathy	Statistical analysis	Overall quality rating
Akün (2017)	MODERATE	MODERATE	STRONG	STRONG	WEAK	MODERATE	**MODERATE**
Akün & Batıgün (2019)	MODERATE	WEAK	STRONG	STRONG	WEAK	STRONG	**WEAK**
Akün et al. (2018)	MODERATE	WEAK	STRONG	STRONG	WEAK	MODERATE	**WEAK**
Aydin et al. (2019)	MODERATE	MODERATE	STRONG	STRONG	STRONG	MODERATE	**STRONG**
Baker & Hoerger (2012)	WEAK	WEAK	WEAK	STRONG	STRONG	MODERATE	**WEAK**
Carvalho et al. (2015)	MODERATE	WEAK	WEAK	STRONG	STRONG	STRONG	**WEAK**
Carvalho et el. (2016)	MODERATE	MODERATE	WEAK	STRONG	STRONG	STRONG	**MODERATE**

Chatziioannidis et al. (2019)	MODERATE	MODERATE	WEAK	STRONG	STRONG	STRONG	**MODERATE**
Edell & Kaslow (1991)	WEAK	WEAK	STRONG	WEAK	WEAK	MODERATE	**WEAK**
Fisher et al. (2010)	STRONG	MODERATE	STRONG	STRONG	STRONG	MODERATE	**STRONG**
Fisher et al. (2011)	MODERATE	WEAK	STRONG	STRONG	STRONG	MODERATE	**MODERATE**
McCreadie et al. (1994)	MODERATE	WEAK	WEAK	STRONG	WEAK	MODERATE	**WEAK**
Sheinbaum et al. (2015)	MODERATE	WEAK	WEAK	STRONG	STRONG	STRONG	**WEAK**
Skagerlind et al. (1996)	MODERATE	MODERATE	WEAK	STRONG	STRONG	MODERATE	**MODERATE**

PART II: EMPIRICAL RESEARCH PROJECT

Investigating specific relationships between childhood trauma and psychosis symptoms and the mediating roles of emotions and schema

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Supervised by

Dr Amy Hardy, Professor Richard Emsley and Professor Philippa Garety

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ABSTRACT

Background: Childhood trauma may be a potent risk factor for psychosis as it gives rise to certain psychological mechanisms implicated in specific symptoms. However, more methodologically-robust research is needed to account for co-occurring trauma types and different psychosis symptom clusters.

Method: In a sample of 171 adults with schizophrenia-spectrum diagnoses, latent class analysis (LCA) was performed to identify childhood trauma profiles. Exploratory factor analysis (EFA) was then used to investigate the factor structure of hallucinations and delusions symptoms. Associations of trauma class with hallucination and delusion sub-types were investigated using structural equation models (SEM) with anxiety, depression and negative schema entered as hypothesised mediators.

Results: Four discrete childhood trauma classes were identified: emotional abuse/neglect (n = 29), physical abuse (n = 14), sexual abuse (n = 19) and multi-abuse (n = 84). The EFA identified two hallucinations factors: auditory and multi-modal hallucinations; and three delusions factors: persecutory, grandiose/religious and delusions of influence. There was a significant association of emotional abuse/neglect and multi-abuse with persecutory delusions and delusions of influence that were all mediated through anxiety. There was a significant association of physical abuse with grandiose/religious delusions that was not explained by any of the mediators. Trauma class was not significantly associated with auditory or multi-modal hallucinations.

Conclusions: Findings indicate that anxiety may have a particularly potent role in relationships between childhood trauma and hallucinations and delusions, which is consistent with existing theories of an affective pathway to psychosis.

1. INTRODUCTION

Over the last twenty years, substantial progress has been made in understanding psychosis. Whilst the dominant medical model traditionally conceptualised experiences, such as hearing voices and holding unusual beliefs, as signs of 'illness' resulting from faulty brain pathology (Read & Gumley, 2008), psychological approaches have led to greater recognition of the role of psychosocial factors (van Os & Verdoux, 2003; Garety et al. 2007). One social factor that has received extensive interest is childhood trauma, and studies yield consistent findings that this factor is implicated in psychosis risk (Bendall et al. 2013). However, there is enduring controversy around the validity of the diagnostic construct of schizophrenia (Cooke & Kinderman, 2018) and conceptual issues have arisen around how to define trauma clinically and empirically (Hardy et al. 2020). Together, these debates have led to calls for the application of dimensional and symptom-based measures to better understand the trauma-psychosis link (Gibson, Alloy & Ellman, 2016). This study aims to expand existing research by investigating the factor structure of hallucinations and delusions in a clinical sample and testing putative trauma-psychosis links in relation to three hypothesised psychological mediators.

1.1. Childhood trauma as a risk factor for psychosis

Childhood trauma is a broad term generally used to conceptualise a range of adverse victimisation experiences (Morgan & Gayer-Anderson, 2016). The four most common trauma types studied in psychosis research tend to be childhood sexual abuse, physical abuse, emotional abuse and neglect (Baudin et al. 2017). Empirical evidence has robustly shown that experiencing victimization in childhood is associated with a 2 to 3 fold rise in psychosis risk when diagnosis is

used as a broad outcome (Varese et al. 2012; Matheson et al. 2013; Trotta et al. 2015). There is also evidence to suggest that experiencing multiple childhood traumas further increases risk of psychosis, leading to the proposal that there may be a large shared effect of different trauma types on psychosis risk (Trauelsen et al. 2015; van Nierop et al. 2014). However, others have hypothesised that specific types of trauma may predict certain symptoms (Bentall & Fernyhough, 2008) and more recently, researchers have moved towards symptom-based approaches to investigate putative trauma-psychosis links. For example, a recent meta-analysis (Bailey et al. 2018) found that in adults with schizophrenia-spectrum diagnoses, there was evidence for a specific relationship between childhood sexual abuse and total positive symptoms, with a stronger association for hallucinations over delusions, and delusions with total trauma over discrete victimisation sub-types. However, the specific nature of the trauma-psychosis link continues to be debated; firstly, because the expression of psychosis symptoms seems to be multidimensional across both clinical and non-clinical populations (van Os & Reininghaus, 2016), and secondly because victimisation events rarely occur in isolation which poses challenges for examining their relative contributions to psychosis (DeRosse et al. 2014)

1.2. Measurement of psychosis

There is empirical interest in conducting symptom specific research in the context of ongoing debate about the utility of the schizophrenia diagnosis (Cooke & Brett, 2020) and in light of growing evidence to indicate that more common, sub-clinical experiences (e.g. hearing voices or holding unusual beliefs) may be associated with some of the same risk factors for schizophrenia-spectrum diagnoses, including childhood victimisation (Guloksuz & van Os, 2018). A key limitation of

the existing trauma-psychosis literature is that individual studies adopting a symptom-specific approach tend to define specificity differently; for example, some report global symptoms (i.e. positive vs. negative symptoms) and others report certain types of symptoms (e.g. hallucinations vs. delusions); however very few have looked at positive symptoms in detail. This is problematic given that hallucinations and delusions are often multi-dimensional (Steel et al. 2007). Data reduction methods, such exploratory factor analysis (EFA) have been used to derive symptom dimensions in clinical psychosis samples, with several studies identifying a two-factor model of hallucinations comprised of auditory and non-auditory hallucinations (Paolini, Moretti & Compton, 2016; Galletti et al. 2017). The data for delusions appears to be more variable, however some studies have identified different symptom dimensions based on attribution sub types (threat/non-threat and self/other) (Kimhy et al. 2005; Tibber et al. 2018). This highlights the potential utility of using symptom-based approaches in psychosis research, particularly in the context of specificity debates regarding trauma-psychosis links.

1.3. Measurement of childhood trauma

Another key limitation of existing research is that studies have tended to focus on trauma types independently from each other or provide a global composite measure of childhood trauma severity. This is problematic given that childhood victimization events are unlikely to be mutually exclusive (van Dam et al. 2015). Some studies using multivariate approaches indicate that childhood sexual abuse is more strongly linked to psychosis risk compared to other victimisation sub-types (McGrath et al. 2017), however confidence intervals often overlap with other forms of trauma exposure (van Nierop et al. 2014). These limitations

highlight the value of applying multivariate methods in psychosis research, as they can capture exposure to multi-victimization that people with psychosis commonly report (Shevlin et al. 2013). An approach such as latent class analysis (LCA) can identify distinct profiles or 'classes' of exposure to trauma types (Roesch, Villodas & Villodas, 2010). This method is becoming increasingly popular in mental health research, and a recent systematic review (O'Donnell et al. 2017) of 17 studies found some evidence for homogenous abuse profiles in clinical and non-clinical samples, characterised by sexual trauma, non-sexual trauma and multiple trauma exposure, with multiple trauma classes consistently showing poorer psychiatric outcomes than other classes. To date, no study has used this approach to identify distinct abuse typologies in a clinical sample of adults with psychosis. Further research is required which can account for multiple forms of childhood abuse and unique combinations of discrete trauma sub-types.

1.4. The role of affect and schema as hypothesised mediators

Cognitive models of psychosis propose that childhood trauma leads to the development of negative beliefs about the self and others, resulting in emotional changes and anomalous experiences, which are then externalized and give rise to the positive symptoms of psychosis (Garety et al. 2001; Bentall et al. 2007). It has also been proposed that if childhood trauma does play a causal role in psychosis, then its effect on hallucinations and delusions may be different (Bentall & Fernyhough, 2008). It has been proposed that childhood victimization may have a more direct role in hallucinations, based on studies which have found that trauma-related intrusions shape the content of hallucinations (McCarthy-Jones & Longden, 2015; Peach et al. 2020). More recently, a specific link between childhood sexual abuse and auditory hallucinations has been proposed,

hypothesized to occur through attachment-related processes including negative beliefs and emotion regulation (Bentall et al. 2014). This idea has gained some empirical support from studies that have identified dissociation and anxiety as mediators in this relationship (Anketell et al. 2010; Varese, Barkus & Bentall, 2012; Hardy et al. 2016).

Conversely, it has been suggested that the influence of childhood trauma on delusions may be through negative ideas about the self, leading to negative emotions and low self-esteem which are known risk factors for paranoia (Gracie et al. 2007). A possible link between childhood emotional abuse/neglect with persecutory delusions has also been proposed (Bentall et al. 2014) and some studies have found that depression and negative self/other beliefs may mediate this relationship (Wickham & Bentall, 2016; Appiah-Kusi et al. 2017). However, a consensus has not been been reached about the role of affect and schema as mediators in specific trauma-psychosis relationships and further research is required.

1.5. Rationale for current study

Empirical evidence has consistently demonstrated an association between childhood trauma and psychosis, and within psychosis, there is emerging evidence that specific trauma types impact certain symptoms through different cognitive and affective processes. However, evidence of specificity is generally more equivocal due to variation in how trauma exposure is assessed, as multi-victimization is often not considered, and because psychosis symptom sub-types have not been investigated in detail. Thus, it is clear that methodological and statistical approaches are needed to resolve the limitations of previous work investigating the specificity proposal. This study aims to address these limitations

by using dimensional approaches to investigate specific relationships of childhood trauma exposure with hallucinations and delusions in a clinical sample and testing hypotheses related to three putative mediating mechanisms.

1.6. Aims

This study had four key aims:

1. *To identify latent classes of childhood trauma exposure in a clinical sample*
2. *To explore the factor structure of hallucinations and delusions symptoms*
3. *To examine associations between trauma classes and psychosis symptoms*
4. *To investigate the mediating roles of anxiety, depression and negative schema in identified associations of trauma class with psychosis symptoms*

2. METHOD

2.1. Participants

The sample for this study consisted of participants recruited to two linked randomized experimental studies investigating cognitive mechanisms of change in delusions; Freeman et al. (2014) (REC ID: 13/LO/0690) and Garety et al. (2015) (REC ID: 07/H0803/140). Individuals with schizophrenia-spectrum diagnoses and current delusions were recruited from community adult psychosis teams across six mental health services in the UK. The studies employed randomisation to one of two experimental manipulations to investigate hypothesised cognitive, emotional, and social processes in persecutory delusions: anxiety, negative self/other beliefs, reasoning biases and social exposure. Fifty participants completed each manipulation, with a total of 200 participants across the two studies. Demographic data, trauma exposure, assessment of symptoms and psychosocial processes were collected at baseline and a three-month follow-up, however the current study was a cross-sectional design. Further details of the original studies can be found in Freeman et al. (2014) and Garety et al. (2015).

2.2. Inclusion/exclusion criteria

Inclusion criteria: Aged 18-65 years; Psychosis, non-affective (ICD-10, F20-F28); Current delusion on the Schedules for Clinical Assessment in Neuropsychiatry (SCAN; Wing et al. 1990); A score of >0 on visual analogue scale (VAS) for paranoia distress; no major symptom relapse or acute crisis in the last three months, sufficient English to complete the measures and participate in the experimental manipulations.

Exclusion criteria: Primary diagnoses of substance misuse disorder, organic condition (e.g. dementia) or intellectual disability.

2.3. *Measures*

2.3.1. Childhood trauma exposure

The Trauma History Questionnaire (THQ; Green, 1996) is an 18-item interview assessing lifetime exposure to stressful and potentially traumatic events. These include episodic or persistent events which are coded by type and the age at which the event first and last occurred, which can then be coded into childhood, adult or lifetime trauma. Trauma type is categorised into non-victimisation (war, natural disasters, accident and illness) and victimisation (sexual, physical and emotional abuse) events. Childhood sexual abuse is coded from 3 items assessing unwanted sexual experiences or intercourse below aged 17 years; Childhood physical abuse is coded from 4 items; two assessing physical attack with/without a weapon, one item assessing physical abuse within the household and a bullying item. For the present study, this item was reviewed for endorsement of feared death/ serious harm or actual injuries sustained during the event. Childhood emotional abuse is coded from a bullying item, which assesses experiences of being tormented, teased or taunted by others. It was recognised that this item could also pick up on acts of physical cruelty or torment, so to obtain a purer measure of emotional victimisation, emotional abuse was categorised if physical harm or injury were not reported on the item. Last, the THQ 'Other' item were reviewed for reports of victimisation/non-victimisation events, and those identified as victimisation traumas were coded into childhood sexual, physical or emotional abuse accordingly. For this study, childhood trauma was coded as

binary (0 –no trauma, 1 – trauma) for each victimisation event occurring prior to the age of 17 years. The THQ has acceptable psychometric properties for use in clinical samples (Mueser et al. 2001).

The Childhood Experience of Care and Abuse Questionnaire (CECA-Q; Smith et al. 2002) is a retrospective self-report questionnaire to assess adverse caregiving experiences prior to aged 17 years. The CECA-Q has well established validity and reliability (Bifulco et al., 2005). Each scale is each made up of sixteen items (eight for each caregiver) which are rated on a 5-point Likert scale (1 = not at all; 5 = definitely), with higher ratings reflecting more severe maltreatment. Mother/Father Antipathy subscales assesses recollections of hostile, cold and rejecting behaviours from each caregiver (e.g. “She/ He was very critical of me”) and the Mother/Father Neglect subscales assess caregiver interest in material, health and social needs (e.g. “He/She neglected my basic needs”). Composite Parental Antipathy and Neglect scores are created by combining the total ratings for each caregiver on each scale. For the present study, total scores for Parental Antipathy and Neglect were dichotomised (0-absent, 1 - present) based on standardised severity cut offs (Mother Antipathy= >28; Father Antipathy= >30; Mother Neglect= >25; Father Neglect= >26). This approach has been used in other studies to detect exposure to severe antipathy and neglect rated as ‘moderate-marked’ in the CECA interview (Fisher et al. 2011).

2.3.2. Psychosis symptoms

The Scales for the Assessment of Positive Symptoms (SAPS; Andreasen, 1986) consists of 35 items measuring positive symptoms of psychosis over the past month. Each item is rated on a 6-point scale (0- 5), with higher ratings

indicating more severe psychosis symptoms. For this study, the items making up the hallucinations and delusions sub-scales were used: *Hallucinations* (Six items: 1. Auditory; 2. Voices Commenting; 3. Voices Conversing; 4. Tactile/Somatic; 5. Olfactory; and 6. Visual); *Delusions* (Twelve items: 1. Persecutory; 2. Jealousy; 3. Guilt/Sin; 4. Grandiose; 5. Religious; 6. Somatic; 7. Reference; 8. Being controlled; 9. Mind being read; 10. Thought broadcast; 11. Thought Insertion; 12. Thought withdrawal). The SAPS positive scale has been shown to have good internal reliability, criterion validity and factorial validity (Peralta & Cuesta, 1999).

2.3.3. Psychological mediators

The Beck Depression Inventory (BDI; Beck, Steer & Brown, 1996) is a 21 item self-report questionnaire assessing symptoms of depression over the past two weeks. Each item is rated on a 4-point scale (0–3) providing a total score (0–63), with higher scores reflecting greater depression severity. The BDI has high internal consistency and good convergent and discriminative validity (Wang & Gorenstein, 2013). Total depression scores were used in this study.

The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1998) is a self-report measure assessing anxiety symptoms over the past two weeks. It is comprised of 21 items, each rated on a 4-point scale (0–3) providing a total score (0–63), with higher scores indicating greater anxiety severity. The BAI has high internal consistency and good convergent validity (Osman et al., 1997). Total anxiety scores were used in this study.

The Brief Core Schema Scale (BCSS; Fowler et al., 2006) is a 24-item self-report questionnaire which assesses negative and positive beliefs about the self and others. It consists of four scales: Negative Self (e.g. “I am worthless”),

Negative other (e.g. “Other people are hostile”), Positive Self (e.g. “I am valuable”) and Positive Other (“Other people are good”). Each item is rated on a 5-point scale (0-4), with higher scores indicating greater belief strength. The scale has good internal and test-retest reliability, and convergent validity (Fowler et al., 2006). For the study, the Negative Self and Negative Other subscales were used.

2.4. Data analysis

All analyses were performed using Stata version 15.0 (StataCorp, 2017). To address the key research aims, data analysis was completed in three stages.

Stage 1: Latent Class Analysis (childhood trauma exposure)

To address Aim 1, Latent Class Analyses (LCA) was performed on the trauma data. Four childhood abuse variables were used as dichotomous trauma indicators: 1. Sexual abuse (3 items- THQ); 2. Physical abuse (3 items - THQ); 3. Emotional abuse (2 items - THQ Bullying item and Parental Antipathy item of the CECA-Q); and 4. Neglect (CECA-Q Parental Neglect item). A dichotomous variable was created to capture the presence of childhood trauma across each of the four abuse variables (0 – no trauma, 1 = trauma). Missing scores on each of the four variables ranged from 2.3-6.4% across the sample. As analysis of the missing data revealed no patterns, Maximum Likelihood (ML) was used to estimate the latent class models. Using the four indicators, two to six class solutions were performed. Model fit indices were used to decide the best-fitting model for the data; with lower Akaike Information Criterion (AIC) (Akaike, 1987) and Bayesian Information Criterion (BIC; Schwarz, 1978) values demonstrating better model fit. Interpretation of each class model was founded upon the percentage of the sample estimated to belong to a class (class membership

probabilities) and the percentage of participants in each class estimated to have been exposed to each trauma indicator (item response probabilities). Class membership probabilities below 5% of the sample (<9 participants) were deemed to have limited predictive value. In total, 20 participants reported no childhood trauma on each of the four variables and their data was excluded from the LCA. This group was treated as the reference category at the final stage of the analysis.

Stage 2: Exploratory Factor Analysis (psychosis symptoms)

To address Aim 2, Exploratory Factor Analyses (EFA) were conducted on the SAPS data; one for the six hallucinations items and one for the twelve delusions items. The ordinal score (0-5) for each item was used. Factors were rotated using an oblique rotation (Oblimin) procedure with Kaiser Normalisation. This rotation method was applied to provide information on correlations amongst the factors, based on empirical evidence that clinical psychosis samples are likely to report symptoms across different domains (Peralta & Cuesta, 1999; Steel et al. 2007).

Stage 3: Structural Equation Modelling (associations of trauma and psychosis symptoms and mediating roles of emotions and schema)

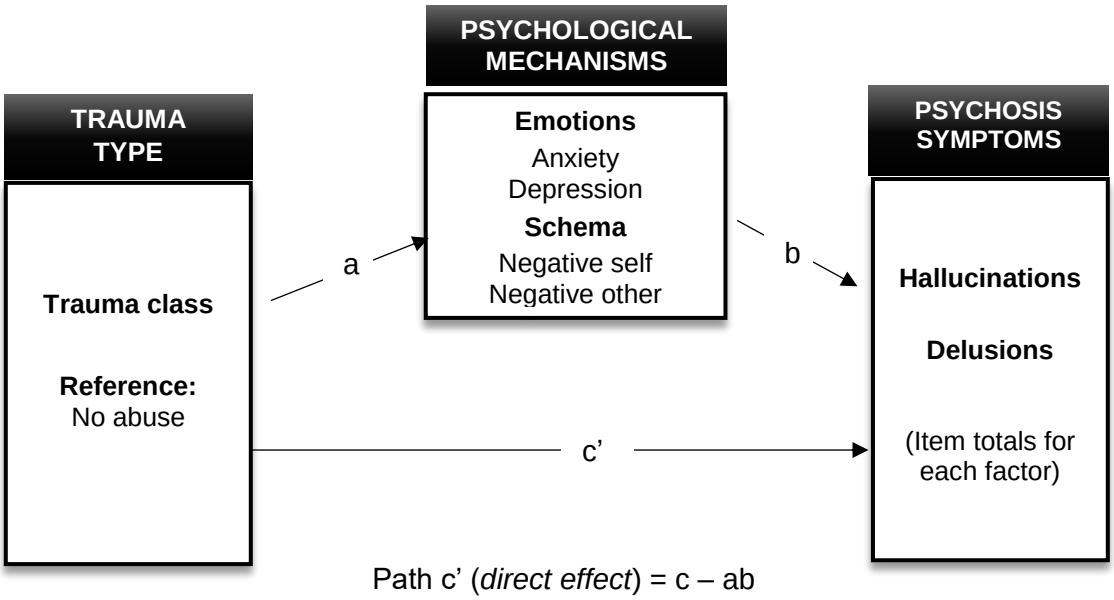
To address Aim 3 and 4, structural equation models (SEM) were fitted to explore associations between the identified latent childhood trauma classes and psychosis symptom profiles. First, four linear regressions were conducted to investigate associations between the trauma classes and four proposed mediators (anxiety, depression, negative self and negative other schema). For significant trauma class x mediator associations, two structural equation models were estimated to investigate associations between trauma class and psychosis symptoms; one model for hallucinations and one for delusions, both conditional

on the no trauma group and any significant mediator(s) identified at stage 1. Causal mediation analysis was performed using the product of coefficients method (Alwin & Hauser, 1975). From this point forward, we refer to the effect of trauma class on each mediator as **path a**, the effect of the mediator, adjusting for trauma class, on psychosis symptoms as **path b**, the *direct* effect of trauma class on psychosis symptoms, controlling for the mediators, as **path c'** and the *indirect* effect of trauma class on psychosis symptoms, in the presence of the mediators, as **path ab**. The proposed mediation framework is outlined in Figure 1.

2.5. Statistical power

Guidelines have been published for determining the sample size required for mediational studies with 80% statistical power (Kline, 2015). This is based on evidence of the minimum sample size needed to identify a mediated effect using SEM software (n = 152; Fritz & McKinnon, 2007). Therefore, we estimated that a sample n = 171 would have 80% power to detect a significant effect of trauma class on the primary outcome of psychosis symptoms and the associated mediators.

Figure 1. Proposed mediation framework



Path c' (*direct effect*) = c – ab
Path ab (*indirect*) mediated effect = c- c'

3. RESULTS

3.1. Demographic information

In total there were 171 participants in the sample, with a mean age of 42.2 years (*SD*= 10.9, range = 19-65). The majority were male (62%), White British/White Other (58.5%) and spoke English as a first language (90.1%). Most participants had an ICD-10 diagnosis of Paranoid Schizophrenia (87.7%), and the rest had Schizoaffective Disorder (6.1%), Delusional Disorder (4.9%) or Other Nonorganic Psychosis (1.2%). All demographic information is presented in Table 1.

Table 1. Demographic characteristics of the sample (n =171)

Variable	*Mean or n*	*SD or %*
Age		
Mean (*SD*)	42.2	(10.9)
Gender		
Male	106	(62.0)
Female	65	(38.0)
Ethnicity		
White British/White Other	100	(58.5)
Black British/African/Caribbean	45	(25.3)
Asian British/Indian/Pakistani	8	(4.7)
Mixed British/Mixed Other	14	(8.2)
Other	4	(2.3)
English first language		
Yes	154	(90.1)
No	17	(9.9)

Civil status		
Single	121	(70.8)
Married or cohabiting	16	(9.4)
Separated	33	(19.3)
Other	1	(0.6)
Employed		
Yes	15	(8.8)
No	156	(91.2)

Note: M: mean; *SD*: standard deviation; *n:* number of cases; %: percentage

3.2. Aim 1: To identify latent classes of childhood trauma exposure in a clinical sample

3.2.1. Rates of childhood victimisation

In total, 166 participants had completed a measure of childhood victimisation (THQ, n = 143; CECA-Q, n = 101) and were included in the analysis. The most common type of victimisation on the THQ was psychological bullying (50.3%) followed by physical violence within the family home (34.7%) and unwanted sexual experiences (35.5%). The least commonly endorsed on the THQ was forced sexual intercourse (16.8%). The most commonly endorsed form of victimisation on the CECA-Q was paternal antipathy (32.9%) and the least common was maternal neglect (19.2%). In total, 12% of the sample indicated that they had not experienced any trauma, 21.6% reported one trauma, 21% two, 15.6% three, 23.4% four and 6% reported five or more traumas. Table 2 shows the frequencies of childhood victimisation trauma exposure on the THQ and CECA-Q for the whole sample.

Table 2. Rates of childhood victimisation in the sample (n=166)

Trauma exposure	N	%
Sexual abuse[a]	64	38.3%
Unwanted sexual experience	59	35.5%
Forced sexual intercourse	28	16.8%
Physical abuse[a]	93	55.7%
Assault with weapon	30	18.0%
Assault without weapon	35	21.0%
Physical abuse in the household	58	34.7%
Emotional abuse	105	62.9%
Bullying	84	50.3%
Mother antipathy	53	31.7%
Father antipathy	55	32.9%
Neglect[b]	67	40.1%
Mother neglect	32	19.2%
Father neglect	48	28.7%
Total traumas reported		
0	20	12.0%
1	36	21.6%
2	35	21.0%
3	26	15.6%
4	39	23.4%
5+	10	6.0%
Any Childhood Trauma	146	87.4%

[a] n = 161, [b]n = 165

3.2.2. Latent class models of trauma exposure

Latent class analyses were performed on data from 146 participants. Table 3 outlines the fit indices for the sequential class solutions, with the best fitting model statistics highlighted in bold. AIC values decreased up to the 5-class model, where the value increased, indicating that the 5-class model was a poorer fit than the 4-class model. The 6-class model identified an additional latent class comprised of only 5 participants, which was considered to not provide predictive utility of class membership. This indicated that the 3 and 4-class models best fit the data. The loglikelihood statistic was higher for the 3-class model, however the 4-class model had the lowest AIC and BIC values of all the solutions, demonstrating a better fitting solution. Moreover, the profile plot for the 4-class solution (Figure 2) showed a latent class characterised by participants with higher response probabilities for childhood physical abuse compared to other abuse types, which was not identified in the 3-class solution. The 4-class model was therefore accepted based on the fit indices and to assess possible associations of childhood physical abuse with psychosis symptoms and the proposed mediators.

Table 3. Fit information for the latent class models (n = 146)

Classes	df	LL[a]	AIC	BIC
2	9	-354.08	726.17	752.64
3	13	-348.18	722.36	760.60
4	**14**	**-340.56**	**709.13**	**750.31**
5	22	-336.51	717.02	781.74
6	22	-335.58	715.15	779.87

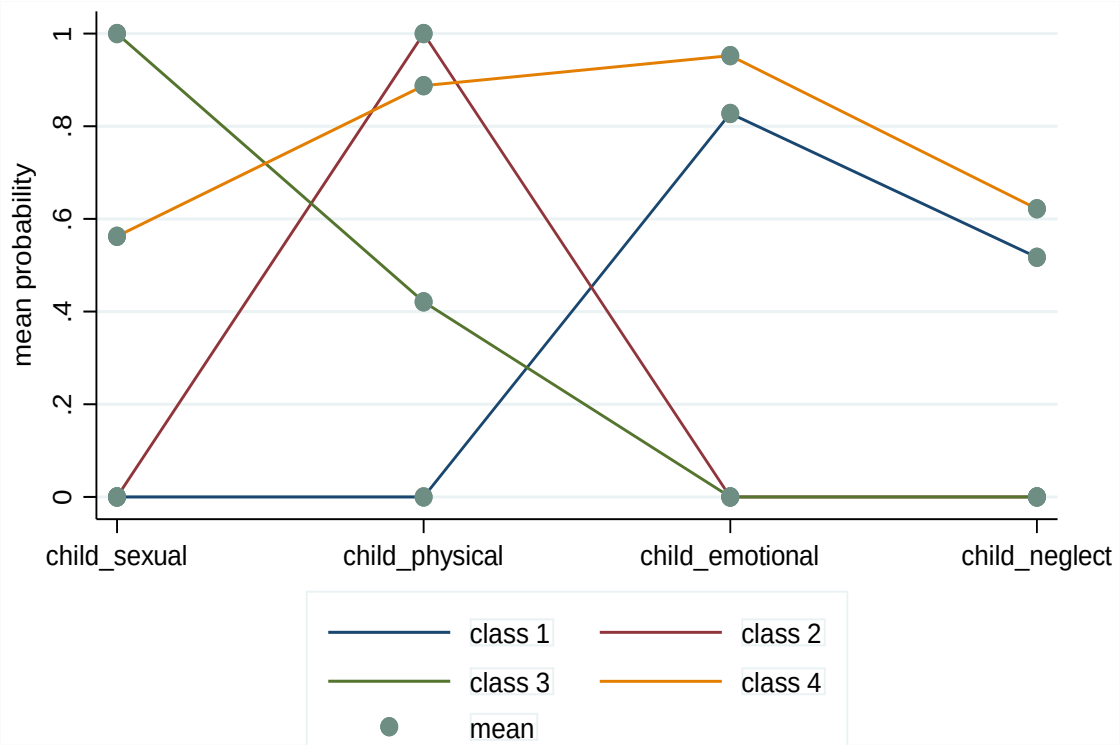
[a] Loglikelihood for class solution

Table 4 outlines the probabilities of class membership and item response for each trauma indicator across the four classes. Class 1 (16%) was characterised by high response probabilities for child emotional abuse (78%) and neglect (52%) relative to other abuse types (0%). This class was labelled the 'child emotional abuse and neglect class'. Class 2 (10%) was characterised by high response probabilities for child physical abuse (99%) relative to the other abuse types (0-1%). This class was labelled the 'child physical abuse' class. Class 3 (15%) was characterised by high response probabilities for child sexual abuse (99%) relative to other abuse types (0-41%). This class was labelled the 'child sexual abuse' class. Lastly, Class 4 (60%) was characterised by moderate to high response probabilities for all childhood trauma sub-types (51-98%). This class was labelled the 'multiple childhood abuse' class. The four-class model was used at the final stage of analysis to investigate associations between childhood trauma profiles, psychosis symptoms and putative mediators.

Table 4. Latent class probabilities for the 4-class model (n = 146)

	Class 1: Emotional abuse/neglect (n = 29)	**Class 2: Physical abuse (n = 14)**	**Class 3: Sexual abuse (n = 19)**	**Class 4: Multiple abuse (n = 84)**
Pr (Class)	0.16	0.10	0.15	0.60
Probability of:				
Child sexual	0.00	0.01	**0.99**	**0.51**
Child physical	0.00	**0.99**	0.41	**0.82**
Child emotional	**0.78**	0.00	0.09	**0.98**
Child neglect	**0.52**	0.00	0.00	**0.62**

Figure 2: Latent class profile plot for the 4-class model (n = 146)



3.2.3. Demographic differences between the classes

Demographic differences between the classes and the no trauma group were examined. Fisher's exact tests were used for categorical data and one-way ANOVAs were performed on continuous data. There were no significant differences between the classes/no trauma group in terms of age, F (4,161) = 0.7, p = 0.6, ethnicity, χ^2 (16) = 19.8, p = 0.2, language, χ^2 (4) = 3.2, p = 0.5, civil status, χ^2 (12) = 13.89, p = 0.13, or employment, χ^2 (12) = 6.56, p = 0.09. There was a significant difference between the classes in terms of gender, χ^2 (4) = 12.90, p <0.01. Inspection of the adjusted residuals indicated a greater proportion of females (adjusted residual = 3.5) and lower proportion of males (adjusted residual = -3.5) in the multiple abuse class than would be expected by chance. Gender was therefore controlled for in the final models. Table 5 displays the characteristics of the sample by class membership.

Table 5. Demographic characteristics of the sample by class (n = 166).

	Emotional abuse/ neglect (n = 29)	**Physical abuse (n = 14)**	**Sexual abuse (n = 19)**	**Multiple abuse (n = 84)**	**No trauma (n = 20)**	***F or χ²,* *p***
Age						
M (*SD*)	42.7 (10.7)	38.6 (8.4)	45.1 (12.9)	42.1 (10.7)	41.9 (12.2)	0.7, *0.6*
Gender						
Male	22 (75.9)	11 (78.6)	13 (68.4)	40 (47.6)	15 (75.0)	12.9, *0.01**
Female	7 (24.1)	3 (21.4)	6 (31.6)	44 (52.4)	5 (25.0)	
Ethnicity						
White	21 (72.4)	6 (42.9)	10 (52.6)	48 (57.1)	13 (65.0)	19.8, *0.2*
Black	4 (13.8)	8 (57.1)	4 (21.1)	26 (31.0)	3 (15.0)	
Asian	2 (6.9)	0 (0.0)	1 (5.3)	2 (2.4)	2 (10.0)	
Mixed	2 (6.9)	0 (0.0)	3 (15.8)	7 (8.3)	1 (5.0)	
Other	0 (0.0)	0 (0.0)	1 (5.3)	1 (1.2)	1 (5.0)	
English first language						
Yes	27 (93.1)	11 (78.6)	16 (84.2)	77 (91.7)	18 (90.0)	3.2, *0.5*
Civil status						
Single	23 (79.3)	11 (78.6)	10 (52.6)	58 (69.1)	14 (70.0)	*13.9, 0.1*
Married/co-habiting	5 (17.2)	0 (0.0)	4 (21.1)	6 (7.1)	1 (5.0)	
Separated	1 (3.5)	3 (21.4)	5 (26.3)	19 (22.6)	2 (25.0)	
Employed						
Yes	2 (6.9)	3 (21.4)	3 (15.8)	4 (4.8)	3 (15.0)	6.6, *0.09*

3.3. Aim 2: To explore the factor structure of hallucinations and delusions symptoms

3.3.1. Hallucinations

The six hallucination items were reviewed for endorsement frequency across the sample. Only olfactory hallucinations were endorsed in below 10% of the sample (n = 12); however, all items were included to gain a more complete picture of the factor structure of the scale. The final factor analysis loaded the six hallucination items onto two clear and interpretable factors (Table 6). The use of the oblimin rotation method was deemed acceptable as the two factors were moderately correlated at 0.52 (Gerbing & Hamilton, 1996). The first factor represented auditory hallucinations (3 items), accounting for 86.1% of the variance, and the second factor represented multi-modal hallucinations (3 items), accounting for 13.9% of the variance. Hallucination severity scores for the two factors were derived by combining the scores on each item making up the auditory and multimodal hallucinations factors.

Table 6. Rotated factor loadings for SAPS hallucination items

Item	Factor 1: Auditory hallucinations	Factor 2: Multi-modal hallucinations	Uniqueness
1. Auditory hallucinations	**0.81**	0.01	0.33
2. Voices commenting	**0.79**	0.09	0.29
3. Voices conversing	**0.77**	-0.10	0.48
4. Visual hallucinations	0.03	**0.53**	0.84
5. Olfactory hallucinations	-0.01	**0.45**	0.83
6. Tactile/somatic	0.07	**0.41**	0.78

3.3.2. Delusions

The twelve delusions items were inspected for endorsement frequency. Four items were endorsed in less than 10% of the sample: delusions of jealousy, delusions of guilt/sin, grandiose delusions and thought withdrawal. As the jealousy item (Item 2): 'Have you ever worried that your husband (wife) might be unfaithful to you?' was endorsed by only three participants (1.8%), it was excluded from further analysis.

An initial exploratory factor analysis of the remaining eleven delusion items extracted only one factor with an eigenvalue larger than one, so a three-factor solution was run. Based on recommendations (Tabachnick & Fidell, 2014), factor loadings with an absolute value less than 0.32 were supressed, as were items that cross-loaded highly onto other factors. As the somatic item (Item 6): 'Is there anything wrong with your body? Have you noticed any change in your appearance?' loaded weakly onto all three factors, it was excluded from subsequent analysis. Correlations were low between all factors (>0.3) so the analysis was re-run using an orthogonal rotation.

The final factor analysis loaded ten delusions items onto three clear and clinically interpretable factors (Table 7). Orthogonal rotation was considered to be an acceptable method as the three factors were weakly correlated (0.1-0.5). The first factor represented delusions of influence (6 items) and accounted for 71.3% of the variance. The second factor represented grandiose delusions with religiosity (2 items) and accounted for 15.0% of the variance. The third factor represented persecutory delusions (2 items) and accounted for 13.7% of the variance. Delusion severity scores for the three

factors were created by combining the scores on each item making up the delusions of influence, grandiose/religious and persecutory delusions factors.

Table 7. Rotated factor loadings for SAPS delusions items

Item	Factor 1: Delusions of influence	Factor 2: Grandiose/ religious delusions	Factor 3: Persecutory delusions	Uniqueness
1. Persecutory	0.07	0.05	**0.43**	0.82
3. Guilt or sin	-0.03	0.09	**0.41**	0.82
4. Grandiose	0.04	**0.56**	0.00	0.68
5. Religious	0.13	**0.57**	0.13	0.66
7. Reference	**0.34**	0.24	0.19	0.76
8. Controlled	**0.61**	0.08	0.12	0.59
9. Mind read	**0.49**	0.21	0.11	0.70
10. Broadcast	**0.53**	0.05	-0.10	0.70
11.Insertion	**0.56**	0.04	-0.13	0.67
12. Withdrawal	**0.55**	0.04	-0.01	0.69

3.3.3. Psychosis symptom factors by trauma class

Inspection of the data indicated that participants assigned to the physical abuse class endorsed higher mean scores on the auditory hallucinations items (M = 7.1, *SD* = 5.5) relative to the other classes (emotional abuse/neglect, M = 5.4, *SD* = 5.6; sexual abuse, M = 4.4, *SD* = 4.7, multiple abuse, M = 6.0, *SD* = 5.1) and the no abuse group (M = 5.0, *SD* = 4.3). For multi-modal hallucinations, scores were comparable for the emotional abuse and neglect (M = 2.4, *SD* = 2.6) and physical abuse class (M = 2.5, *SD* = 2.4) and the no-abuse group (M = 2.2, *SD* = 2.6). Multi-modal hallucination scores were

highest in the multiple abuse class (M = 2.9, *SD* = 3.1) and lowest in the sexual abuse class (M = 1.2, *SD* = 1.9).

Individuals assigned to the multiple abuse class had higher mean scores on the delusions of influence items (M = 7.6, *SD* = 5.8), with the no-abuse group displaying the lowest scores (M = 4.7, *SD* = 4.3). For the other classes, delusions of influence scores were similar for the emotional abuse and neglect (M = 6.8, *SD* = 5.4) and sexual abuse classes (M = 6.2, *SD* = 5.6) and were lower in the physical abuse class relative to the other classes (M = 5.1, *SD* = 4.5). For grandiose/religious delusions, participants in the physical abuse class had the highest scores (M = 2.3, *SD* = 2.7), relative to the other classes (emotional abuse/neglect, M = 1.5, *SD* = 2.4; sexual abuse, M = 0.8, *SD* = 1.3; multiple abuse, = 1.5, *SD* = 2.3) and the no abuse group (M = 0.4, *SD* = 0.8). Lastly, individuals assigned to the sexual abuse group had the highest mean scores on the persecutory delusions items (M = 4.5, *SD* = 1.9), followed by the emotional abuse/neglect (M = 4.2, SD = 1.7), multiple abuse (M = 4.1, SD = 1.6) and physical abuse (M = 3.8, SD = 1.1) classes. Persecutory delusions scores were lowest in the no-abuse group (M = 3.3, SD = 1.7). Figure 3 displays the SAPS item totals for the five hallucinations and delusions factors across the four classes and the no-trauma group.

3.3.4. Emotions and negative schema scores by trauma class

Inspection of the data indicated that participants in the emotional abuse and neglect class endorsed higher total anxiety (M = 23.6, *SD* = 9.0), depression (M =27.5, *SD* = 12.4) and negative self-other beliefs (M = 9.1, *SD* = 6.0) relative to the other classes and the no-trauma group, followed by participants assigned to the multiple abuse group. For negative other beliefs, scores were

highest for the physical abuse (M = 12.2, SD = 7.5) and sexual abuse classes (M = 12.1, SD = 8.5). Table 8 displays the mean anxiety, depression and negative self/other schema scores across the classes and the no-trauma group. The significance of between-groups differences on the hallucinations and delusions factor totals and the hypothesised mediators were investigated at the final stage of the analysis.

Figure 3. SAPS item totals across the classes and no-trauma group (n = 166)

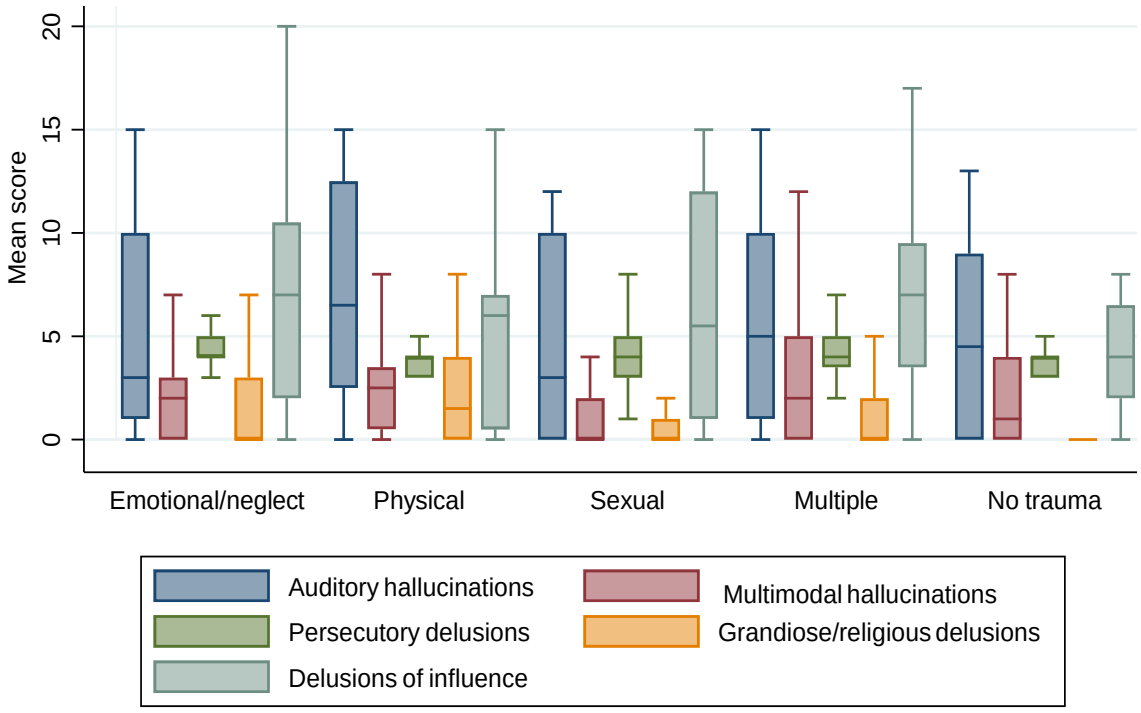


Table 8. Mean scores and standard deviations (*SD*) for the emotion and schema variables across the 4 classes and the no-trauma group (n = 166).

Mediator	Emotional abuse/ neglect (n = 29)	Physical abuse (n = 14)	Sexual abuse (n = 19)	Multiple abuse (n = 84)	No trauma (n = 20)
Anxiety	23.6 (9.0)	22.1 (13.4)	21.5 (13.6)	22.8 (13.9)	15.9 (9.7)
Depression	27.5 (12.4)	18.1 (8.3)	24.0 (15.5)	26.3 (12.6)	22.0 (13.6)
Negative self-schema	9.1 (6.0)	6.1 (6.0)	6.1 (5.9)	7.9 (5.8)	6.9 (5.9)
Negative other schema	11.3 (6.4)	12.2 (7.5)	12.1 (8.5)	11.4 (6.9)	8.3 (5.1)

3.4. Aim 3: To investigate the hypothesized mediating roles of emotions and schema in relationships between trauma class and psychosis symptoms

Path a: Is trauma class associated with emotions and schema?

There was a significant effect of trauma class on anxiety, with participants in the emotional abuse and neglect class (β = 0.23, *p* = 0.03) and multiple abuse class (β = 0.28, *p* = 0.02) reporting significantly higher anxiety than participants with no trauma. There was no significant effect of trauma class on depression (β values = -0.05 – 0.16, *p* values >0.1), negative self- schema (β values = -0.03-0.14, *p* values >0.05) or negative other schema (β values = -0.16-0.18, *p* values >0.1), therefore anxiety was the only hypothesised mediator entered in the final models. Table 9 displays the standardised Beta coefficients for the effect of trauma class on each of the proposed mediators, using the no trauma group as a reference category.

Table 9. The effect of trauma class on emotions and schema (path a).

Trauma class	Emotions		Schema	
	Anxiety β (SE)	Depression β (SE)	Neg Self β (SE)	Neg Other β (SE)
Class 1: Emotional abuse/neglect	0.24* (0.04)	0.16 (0.03)	0.15 (0.03)	0.17 (0.05)
Class 2: Physical abuse	0.13 (0.02)	-0.09 (0.04)	-0.04 (0.02)	0.16 (0.05)
Class 3: Sexual abuse	0.13 (0.02)	0.05 (0.03	-0.04 (0.02)	0.17 (0.04)
Class 4: Multiple abuse	0.28* (0.05)	0.16 (0.03)	0.09 (0.03)	0.18 (0.03)

Note: Standardised Beta coefficients from ordinary least-squares linear regressions, conditional on no trauma group; significance: *p<0.05. Gender included as covariate in all regressions.

3.4.1. Mediation model for hallucinations

Path b: Is there an effect of anxiety on auditory/multi-modal hallucinations?

There was a significant association of anxiety with both auditory hallucinations (β = 0.11, *p* = 0.001, *SE: 0.03*, CI: 0.04-0.17) and multimodal hallucinations (β =0.10, *p* = 0.001, *SE: 0.02*, CI: 0.02-0.10), with higher anxiety scores predicting more severe symptoms on items making up each of the hallucinations factors.

Path c': Is there an effect of trauma class on auditory and multi-modal hallucinations when controlling for anxiety?

Trauma class did not significantly predict the severity of auditory hallucinations (β values = 0.28-1.46-), p >0.05) or multi-modal hallucinations (β values = 0.004-1.26, p >0.05), when anxiety was controlled for, indicating mediation.

Path ab: Is there a relationship of trauma class with auditory and multi-modal hallucinations that is mediated through anxiety?

When anxiety was included in the final model, there was no significant effect of trauma class on hallucinations (β values = 0.32-0.80, *p*>0.05). There was evidence for an effect of multiple trauma (class 4) through anxiety for both auditory (β = 0.72, *p* = 0.06, SE: 0.39, CI:-0.04-1.49) and multi-modal hallucinations (β = 0.40, *p* = 0.06, SE: 0.25, CI:-0.02-0.83) however this did not reach statistical significance at the 5% level. There was also evidence to suggest an effect of childhood emotional abuse and neglect (class 1) through anxiety, for both auditory (β = 0.80, *p* = 0.07, SE: 0.45, CI: -0.08-1.68) and multi-modal hallucinations (β = 0.45, *p* = 0.07, SE: 0.25, CI: -0.04-0.94) that did not reach significance at the 5% level. In sum, there was no significant direct effect of trauma class on hallucinations when controlling for anxiety, nor was there a significant indirect effect of trauma class on hallucinations when anxiety was included as a mediating variable. The final model was found to have poor goodness of fit (χ^2: 14.12, *p* = 0.00; RMSEA: 0.279; CFI: 0.617; TLI: -4.739). Table 11 displays the direct, indirect and total effects of trauma class on the two hallucinations factors.

3.4.2. Mediation model for delusions

Path b: Is there an effect of anxiety on persecutory delusions, grandiose/religious delusions and delusions of influence?

There was a significant effect of anxiety on persecutory delusions (β = 0.33, *p* = 0.001, SE: 0.01, CI: 0.01-0.05); and delusions of influence (β = 0.16, *p* = 0.000, SE: 0.03, CI: 0.10-0.22), with higher anxiety scores predicting more severe symptoms on items making up these factors. There was no significant effect of anxiety on grandiose/religious delusions (β = 0.01, p = 0.43, SE: 0.01, CI: -0.02-0.04).

Path c': Is there an effect of trauma class on persecutory delusions, grandiose/religious delusions and delusions of influence when controlling for anxiety?

Trauma class did not significantly predict the severity of persecutory delusions (β values = -0.58-0.54, *p*>0.05) or delusions of influence (β values = -0.40-1.86, *p*>0.05), when anxiety was controlled for in the model, indicating mediation. When controlling for anxiety, physical abuse (β = 1.80, p = 0.02, SE: 0.78, CI: 0.28-3.32), and multiple abuse (β = 1.06, p = 0.04, SE: 0.54, CI: 0.01-2.11) predicted severity of grandiose/religious delusions, suggesting a relationship of these trauma classes with grandiosity/religiosity that was not mediated through anxiety.

Path ab: Is there a relationship between trauma class and persecutory delusions/ delusions of influence that is mediated through anxiety?

There was a significant indirect effect of emotional abuse and neglect on delusions of influence when anxiety was included in the final model (β = 1.24, p = 0.05, SE: 0.63, CI: -0.04-2.18), indicating that anxiety accounted for the total effect. There was evidence for an effect of emotional abuse and neglect on persecutory delusions that was mediated through anxiety (β = 0.26, p =

0.07, SE: 0.14, CI: -0.02-0.53) however this did not reach significance at the 5% level. There was a significant effect of multiple childhood abuse on persecutory delusions (β = 0.23, p = 0.05, SE: 0.12, CI: -0.01-0.47), indicating that this relationship was mediated fully through anxiety. Lastly, there was a significant indirect effect of multiple childhood abuse on delusions of influence (β = 1.11, p = 0.04, CI: 0.04-2.18) which did not account for the total effect, indicating that anxiety partially mediated this relationship. In sum, anxiety accounted for the total effect of trauma class on persecutory delusions, part of the effect of trauma class on delusions of influence and none of the effect of trauma class on grandiose/ religious delusions. The final model was found to have adequate fit (χ^2: 7.89, p = 0.048; RMSEA: 0.098; CFI: 0.888; TLI: 0.179). Table 12 displays the direct, indirect and total effects of trauma class on the three delusions factors.

Table 10. Direct, indirect and total effects of trauma class on hallucinations, with anxiety as the mediating variable.

Trauma class	Symptom	Path c' (Direct) β (SE), *p*	Path ab (Indirect) β (SE), *p*	Path c (Total) β (SE), *p*
Emotional abuse and neglect	Auditory hallucinations	-0.42 (1.43), 0.77	0.80 (0.45), 0.07	0.05 (0.25), 0.84
	Multi-modal hallucinations	-0.22 (0.79), 0.79	0.45 (0.25), 0.07	0.09 (0.17), 0.62
Physical abuse	Auditory hallucinations	1.46 (1.79), 0.41	0.65 (0.50), 0.19	0.36 (0.31), 0.25
	Multi-modal hallucinations	0.004 (0.98), 0.99	0.36 (0.28), 0.20	0.14 (0.22), 0.63
Sexual abuse	Auditory hallucinations	-1.21 (1.57), 0.44	0.58 (0.45), 0.20	-0.08 (0.27), 0.78
	Multi-modal hallucinations	-1.26 (0.86), 0.14	0.32 (0.25), 0.19	-0.18 (0.19), 0.35
Multiple abuse	Auditory hallucinations	0.28 (1.23), 0.82	0.72 (0.39), 0.06	0.14 (0.21), 0.50
	Multi-modal hallucinations	0.33 (0.68), 0.63	0.40 (0.22), 0.06	0.17 (0.15), 0.26

Note: β = Standardised Beta coefficient from structural equation models; conditional on the no trauma group and controlling for gender.

Table 11. Direct, indirect and total effects of trauma class on delusions, with anxiety as the mediating variable.

Trauma class	Symptom	Path c' (Direct) β (SE), *p*	Path ab (Indirect) β (SE), *p*	Path c (Total) β (SE), *p*
Emotional abuse & neglect	Persecutory delusions	0.17 (0.45), 0.71	0.26 (0.14), 0.07	0.42 (0.46), 0.36
	Grandiose/religious	0.99 (0.62), 0.11	0.09 (0.11), 0.45	1.08 (0.62), 0.08
	Delusions of influence	0.96 (1.48), 0.52	**1.24 (0.63), 0.05***	2.20 (1.57), 0.16
Physical abuse	Persecutory delusions	-0.58 (0.56), 0.30	0.18 (0.15), 0.25	-0.40 (0.57), 0.49
	Grandiose/religious	**1.80 (0.78), 0.02***	0.06 (0.89), 0.50	**1.86 (0.77), 0.02***
	Delusions of influence	-0.40 (1.83), 0.83)	0.86 (0.73), 0.24	0.46 (1.95), 0.81
Sexual abuse	Persecutory delusions	0.54 (0.49), 0.27	0.18 (0.14), 0.20	0.72 (0.51), 0.15
	Grandiose/religious	0.33 (0.68), 0.63	0.06 (0.09), 0.49	0.39 (0.68), 0.57
	Delusions of influence	0.61 (1.63), 0.71	0.90 (0.66), 0.18	1.50 (1.73), 0.39
Multiple abuse	Persecutory delusions	0.17 (0.39), 0.66	**0.23 (0.12), 0.05***	0.40 (0.39), 0.31
	Grandiose/religious	**1.06 (0.54), 0.04***	0.08 (0.10), 0.45	**1.14 (0.53), 0.03***
	Delusions of influence	1.86 (1.26), 0.14	**1.11 0.55), 0.04***	**2.98 (1.34), 0.03***

Note: Standardised Beta coefficient from structural equation models; conditional on the no trauma group and controlling for gender.

4. DISCUSSION

4.1. Summary of findings

The findings of the study provide evidence of potential specificity in the relationship between childhood victimisation and psychosis symptoms and highlights a key role of anxiety in this relationship. Individuals who had a higher probability of reporting emotional abuse/neglect and multiple traumas reported higher levels of anxiety than individuals who had not experienced trauma. Further, anxiety mediated the relationship between these trauma types and multi-modal/auditory hallucinations, and persecutory delusions/delusions of influence. This suggests that anxiety may have a particularly potent role in relationships between childhood victimisation and different sub-types of hallucinations and delusions in adults with schizophrenia-spectrum diagnoses. The findings are largely consistent with the theory of an affective pathway to psychosis (Freeman & Garety, 2003) which proposes that exposure to victimisation in childhood may provide a pathway to psychosis through amplified emotional distress, with anxiety as a key connective component.

4.2. Latent classes of childhood trauma

This study is, to our knowledge, the first to adopt a latent class approach to investigate childhood victimisation exposure in a clinical sample of adults with psychosis. Using this method, four distinct latent classes of childhood trauma were identified, characterised by emotional abuse/ neglect, physical abuse, sexual abuse and multi-abuse. These results build on previous research demonstrating discrete groupings of trauma types in clinical samples (O'Donnell et al. 2017) and highlights the value of applying multivariate methods to better understand associations between childhood trauma and psychosis symptoms.

4.3. Psychosis symptoms

This study found a two-factor model of hallucinations that differentiated between auditory and non-auditory (multi-modal) hallucinations. These results replicated other studies using clinical samples (Peralta & Cuesta, 1999; Galletti et al. 2017). Furthermore, the study found a three-factor model of delusions that appeared to distinguish three appraisal sub-types: (1) non-threatening appraisals related to the self (grandiose/religious delusions), (2) appraisals of passivity or control from external forces (delusions of influence); and (3) threat-based appraisals relating to persecution from others. These results are comparable to existing studies of adults with schizophrenia diagnoses (Kimhy et al. 2005) and first episode psychosis (Paolini et al. 2016); however it should be noted that the present study found a smaller number of delusions factors. This could have occurred for several reasons; for example, due to a smaller sample size and exclusion of less common delusions (e.g. somatic and jealousy) that have been included in other studies. Additionally, this study recruited a clinical sample of individuals with current paranoid delusions which means that sample bias could have affected endorsement rates of other delusion sub-types that were more common in other studies. Nonetheless, given that hallucinations and delusions are multidimensional in different populations (van Os & Reninghaus, 2016), this study supports a symptom specific approach in research.

4.4. Childhood trauma and hallucinations

In contrast to existing empirical research findings, a specific relationship was not found between childhood sexual abuse and auditory hallucinations (Bentall et al. 2014; Hardy et al. 2016). There was, however, evidence of an effect of multiple victimization on both hallucination symptom factors through anxiety, and

this effect size was comparable between auditory and multi-modal hallucinations. This finding may support a role for cumulative trauma in hallucination severity, in that exposure to multiple victimization events leads to greater levels of anxiety, which may predict more severe hallucinations relative to individual trauma sub-types (Shevlin et al. 2013). This may also offer support to existing cognitive models of hallucinations (e.g. Morrison, Wells & Nothard, 2000) which highlight the role of anxiety-related mechanisms, such as worry and attentional threat bias, in the predisposition to hallucinations and distress maintenance. These findings also offer the opportunity to reflect on more nuanced views of cognitive models of psychosis. Recent research has proposed that inner speech processes, such as mental dialogue and reasoning about others' mental states, may feed into externalisation of voices that are formed on the basis of early social interactions (Alderson-Day & Fernyhough, 2016). These mechanisms are commonly found to be impaired in psychosis (Alderson-Day et al. 2014). The association between emotional abuse and neglect with auditory hallucinations in this study may be hypothesised to link to inner speech processes reflecting internal representations of the self and others, which is consistent with cognitive and attachment models of psychosis in relation to emotions and schema (Garety et al. 2001; Read & Gumley, 2008). However, these ideas are tentative and further investigation is needed to develop an understanding of inner speech processes in the relationship between trauma and auditory hallucinations.

4.5. Childhood trauma and delusions

4.5.1. Persecutory delusions

There was evidence of a link between childhood emotional abuse/neglect with persecutory delusions, which builds on previous research indicating specific relationships of emotional abuse/neglect with persecutory delusions in a clinical sample (Hardy et al. 2016). This supports the idea that psychological threat in interpersonal relationships may play a particularly potent role in the maintenance of paranoia in psychosis (Bentall et al. 2014). However, negative self/other schema was not a specific mediator of this association, as has been found in other studies (Wickham & Bentall, 2016; Appisah-Kusi et al., 2017). Instead, the relationship between emotional abuse/neglect and persecutory delusions was fully mediated through anxiety, suggesting that anxiety-related processes may be particularly potent in influencing persecutory delusions (Freeman & Garety, 2003; 2014). Again, the finding that negative schema did not specifically mediate trauma-psychosis links may be due to this being a clinical sample with severe and persistent symptoms, who may have had higher rates of negative self and other schema developed through routes other than childhood trauma (Freeman & Fowler, 2009).

4.5.2. Delusions of influence

The study found that anxiety partially accounted for the relationship between multiple victimisation and delusions of influence. Research has previously identified a role of dissociative processes in the relationship between childhood trauma and passivity phenomena in psychosis (Kilcommons & Morrison, 2005) and as dissociation can be a response to anxiety, these findings support the

idea that delusions of influence/control may be experientially driven by affective processes (Frith, 2012). However, the fact that anxiety was a partial mediator of this relationship means that there may be other cognitive-affective mechanisms driving the relationship between multiple trauma and passivity experiences/beliefs that requires further investigation.

4.5.3. Grandiose delusions

Specific relationships were ascertained between childhood physical and multiple abuse with grandiose/ religious delusions, indicating that grandiose beliefs in psychosis are relevant in trauma. Furthermore, no evidence of mediation through anxiety, depression or schema was found, in contrast to previous findings suggesting an inverse relationship between negative schema, positive relationship with self-esteem and grandiosity (Smith et al. 2006). Previous research has found that in people with psychosis, grandiose delusions may compensate for negative self-beliefs (Smith, Freeman, & Kuipers, 2005) and as a way of coping with traumatic experiences (Isham et al. 2019). In terms of specific mechanisms, grandiose delusions have been associated with appraisals of anomalous experiences (Bortolon et al. 2019) and maintained by cognitive reasoning biases and repetitive imagery-based thinking (Garety et al. 2013; Knowles, McCarthy-Jones & Rowse, 2011). Future research could seek to test hypothesised psychological mechanisms underlying grandiose delusions beyond mania, in order to gain a deeper understanding of the nature and role of childhood trauma in grandiose beliefs for people with psychosis.

4.6. Strengths and Limitations

This study has several strengths which should be discussed. First, it adds to the existing literature in that, to our knowledge, it is the first to investigate latent classes of childhood trauma exposure in a clinical sample of adults with schizophrenia-spectrum diagnoses, and to follow this with robust multivariate methodology to test relationships with psychosis symptoms and hypothesised mediators. This approach is particularly advantageous as it accounts for the co-occurrence of multiple trauma sub-types and was able to identify unique combinations of childhood trauma events in a clinical sample of adults with psychosis. This addresses limitations regarding measurement of trauma in previous research (van Dam et al. 2015) and sheds light on the ways in which early victimization experiences may impact upon certain psychosis symptoms.

In addition, the study expands previous research into childhood trauma in psychosis as it included a clinical control group of adults with psychosis who did not report exposure to childhood trauma. This allowed for empirical tests of differences between the trauma classes and no-trauma group to be conducted in terms of demographic and clinical profiles (e.g. severity of psychosis symptoms, anxiety, depression and negative self/other beliefs) which may allow more valid and robust conclusions to be drawn about the associations identified.

Study limitations should also be considered. First, the wider experimental studies from which this sample was taken (Freeman et al. 2014; Garety et al. 2015) recruited participants with current paranoid delusions from community mental health services, and almost ninety percent of this sample had a diagnosis of schizophrenia. As this was a group with relatively persistent psychosis symptoms, it may have been more difficult to identify trauma-mediator-psychosis

symptom links due to high levels of anxiety, depression and negative schema, and hallucination and delusion severity in the non-trauma group.

Next, the fact that indirect effects between trauma class and psychosis symptoms did not reach significance could have been due to the small number of participants assigned to certain classes (i.e. the physical and sexual abuse classes and no-trauma group) which could have reduced statistical power. In addition, mediation analysis using cross-sectional data has limitations as it implies a causal model (Preacher, 2015). In this study, the mediation models indicated that trauma class caused changes in anxiety and, in turn, anxiety caused changes in hallucinations and delusions. However, as the data was collected at one time point, causal ordering cannot be determined. Further research using longitudinal designs may lead to stronger causal claims about the mediation of specific trauma-psychosis relationships.

Lastly, this study looked at the link between childhood trauma and psychosis symptoms based on three hypothesised mediators, including global anxiety and depression. However, the study did not explore the full range of mediating mechanisms, i.e. other emotional regulation strategies and memory processes indicated by PTSp models of psychosis (e.g. Hardy, 2017; Hardy et al. 2020).

4.7. Implications for clinical practice

Hypotheses relating to causal pathways from childhood trauma sub-types to specific symptoms are supported by a relatively small number of studies. The results of this study were most robust for the impact of multi-victimisation (i.e. the combination of emotional abuse/neglect or the full abuse category) and the role of anxiety linking childhood trauma, hallucinations and persecutory/

referential beliefs. The findings underscore the importance of recognising the co-occurrence of childhood trauma sub-types and adopting a comprehensive approach to assessment and formulation that considers the psychological consequences of multi-victimisation. The findings also support the utility of targeting anxiety-related processes in therapeutic interventions for people who report multiple forms of victimisation. This is timely given recent calls for trauma-related frameworks to be adopted in clinical psychosis services (Bendall et al. 2018), and emerging evidence that such approaches may be helpful for reducing paranoia in clinical samples (van den Berg et al. 2016; Brand et al. 2019).

4.8. Directions for future research

Investigating the relationship between childhood trauma and psychosis using statistical methods that can account for the co-occurrence of trauma sub-types and specific psychosis symptoms is a useful approach. For studies using clinical samples, recruiting a clinical no-trauma group alongside a group exposed to trauma, may help to obtain more robust comparisons across outcome variables. Lastly, future research may benefit from employing assessment measures to identify additional mediating mechanisms, such as those implicated in PTSp models of psychosis (Hardy, 2017; Hardy et al. 2020) which could potentially be targeted in psychological interventions for people with psychosis.

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